Massachusetts Bays Program

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Massachusetts Bays Program Estuary Delineation and Assessment

The Massachusetts Bays Program (MBP) is one of 28 National Estuaries Programs established under the federal Clean Water Act. Through on-the-ground work of coordinators in each of five regions, MBP helps the 50 municipalities situated on Massachusetts Bay and Cape Cod Bay undertake proactive efforts to manage their estuaries.

All National Estuary Programs are guided by a Comprehensive Conservation and Management Plan (CCMP). MBP's first CCMP was developed in 1996 and updated in 2003. MBP is currently preparing to review and update the CCMP with a projected completion date of 2014. A critical component of the CCMP update is to identify the primary estuaries and embayments within the MBP planning region. This work was conducted in 2012 through a contract with Geosyntec Consultants (Acton, MA). The resulting Interim Final Estuary Assessment and Delineation report, attached here, identified 47 estuaries and embayments and their landward and seaward boundaries, and identified and compiled data for 22 resource and stressor indicators to assess three management goals:

1. Reduce bacterial contamination and minimize the risk of eutrophication;
2. Protect and restore estuarine habitat; and
3. Improve the continuity of estuarine habitat.

Detailed maps delineating these boundaries and depicting the results of the assessments are included in the interim final report.

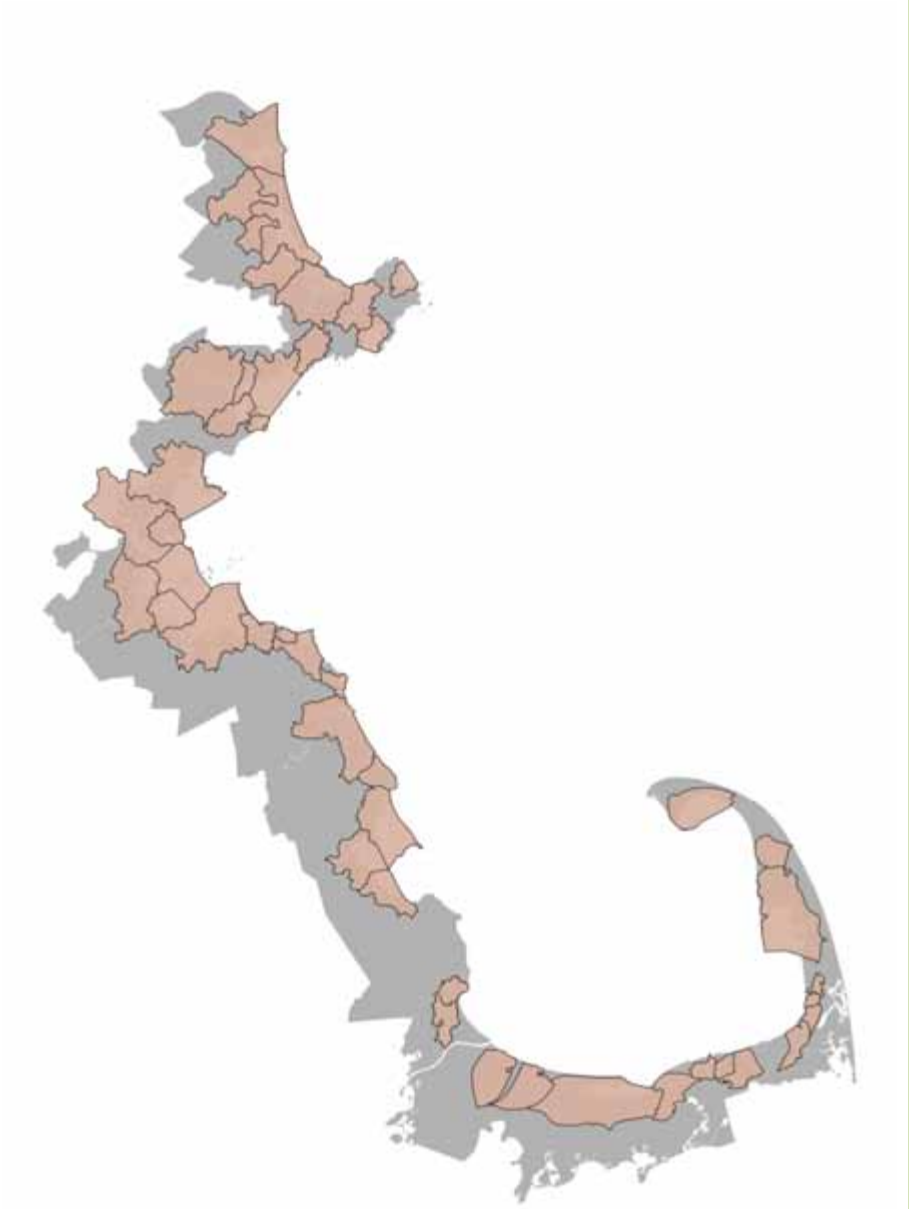
Please note the following:

- This interim final report is not considered by MBP to be a stand-alone document, but rather will serve as input to a larger document, and has no regulatory or management implications.

- The assessment and delineation was conducted to inform the update of MBP's CCMP. The CCMP update process will include opportunities for public input to and comments on this interim final report.

- No prioritization or ranking of estuaries, embayments, projects, or regions has been taken up or finalized as a result of this interim final report.

Thank you for your interest. We look forward to working with all MBP stakeholders as we move forward in our efforts to lay out a comprehensive and strategic conservation management plan that addresses existing and emerging needs in the MassBays region.



October 2012

Massachusetts Bays Program Estuary Assessment and Delineation

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EXECUTIVE SUMMARY

The Massachusetts Bays Program (MBP) is currently in the process of updating its Comprehensive Conservation and Management Plan (CCMP) with new, expanded focus on near-shore estuaries and embayments. This report focuses on the following tasks to aid in the analysis and prioritization of these estuarine areas:

1. Delineate the 47 estuarine watershed boundaries, encompassing all tributary areas that are tidally influenced, as well as open water regions of the estuary that contain important ecological resources;
2. Develop a set of geospatial indicators that can be used to assess the ecological health of each estuarine watershed; and
3. Comparatively analyze each watershed with regard to management priority, both along the entire MBP management area, and within each of the five MBP planning regions.

Estuarine watershed boundaries were delineated using a variety of spatial data, including topography, habitat and coastal ecological resources, regulatory boundaries, groundwater contributing areas, and professional judgment.

A total of 22 geospatial indicators were identified and chosen for the study. They were comprised of both indicators of anthropogenic influence (stressors) as well as extents of various important estuarine resources (resources). Each indicator was also classified according to which of three MBP Management Priorities (MP) they were most suited to apply to, namely:

1. Reduce bacterial contamination and minimize the risk of eutrophication;
2. Protect and restore estuarine habitat; and
3. Improve the continuity of estuarine habitat.

The spatial statistics for each indicator were calculated for each estuarine watershed, the values were ranked, and each watershed was assigned a score based on the ranked quartile (25%) in which it fell. Total scores for stressors, resources, and each of the three Management Priorities were then calculated. The scores were used to assign relative management priority to each watershed as compared to the entire set of 47 estuaries, as well as compared to only the other estuaries within its MBP planning region.

- In the coast-wide analysis, the watersheds with the highest management priority based on their stressors and resources were Saugus River/Pines River/Lynn Harbor, Jones River/Kingston Bay, and Eel River/Plymouth Harbor.
- Neponset River/Dorchester Bay showed the highest priority score for MP1, Bluefish River/Back River/Duxbury Bay showed the highest priority score for MP2, and Parker River showed the highest priority score for MP3.
- Watersheds with a high priority for MP1 are mostly located in the Salem Sound and Boston Harbor regions. MP2 scores and rankings are well distributed along the coast and high priority watersheds for MP2 do not appear to be concentrated in any specific region. High priority areas for MP3 are mostly located in North Shore and Salem Sound.

1. PROJECT BACKGROUND

The Massachusetts Bays Program (MBP) is one of 28 programs in the National Estuary Program System, which is authorized by Section 302 of the Clean Water Act and administered by the U.S. Environmental Protection Agency. The MBP Planning area covers over 800 miles of coastline along Massachusetts and Cape Cod Bays and serves 50 coastal communities from Salisbury, on the New Hampshire Border, to Provincetown at the tip of Cape Cod. The planning area is divided into five management regions: Upper North Shore, Salem Sound, Metro Boston, South Shore, and Cape Cod.

The mission of MBP is guided by a Comprehensive Conservation and Management Plan (CCMP), which is updated periodically to reflect the priorities of the program. MBP is currently in the process of updating the CCMP, which will assess progress since the previous 2003 update and set conservation and management targets for the next five years. This update will expand the management focus of the CCMP to include nearshore estuaries and embayments within the MBP planning area.

MBP selected Geosyntec Consultants, Inc. (Geosyntec) to prepare an Estuary Assessment and Delineation that will lay the groundwork for MBP to periodically assess the health of estuarine systems within its planning area. The Estuary Assessment and Delineation project included the following Tasks:

1. Delineate estuary boundaries;
2. Collect information of a set of ecological indicators;
3. Quantitatively assess each estuary based on the ecological indicators; and
4. Conduct a comparative analysis of each estuary.

MBP has identified five management priorities related to estuarine water quality and estuarine habitat health. Of these five priorities, the first three have been included in this comparative analysis:

1. Reduce bacterial contamination and minimize the risk of eutrophication;
2. Protect and restore estuarine habitat; and
3. Improve the continuity of estuarine habitat.

A variety of geospatial indicators were quantified to rank the importance of each of these management priorities within each watershed and within each of the five MBP management regions. Additionally, the indicators were used to rank the extent of estuarine resources (salt marsh extent, tidal flats, etc.), and the extent of ecological stressors (impervious area, stream crossings, wastewater sources, etc.) within each watershed.

2. DELINEATION OF ESTUARINE BOUNDARIES

The process of estuarine watershed delineation generally consisted of the following three steps:

1. Determine a seaward boundary that encompassed the estuary and any nearby major estuarine ecological resources;
2. Determine a landward boundary that is reflective of the extent of tidal influence within the estuary; and
3. Delineate the watershed that is dictated by the boundaries established in steps 1 and 2.

Given the variety of embayment characteristics across the 47 estuaries, the process described above was sometimes varied on a case-by-case basis. For instance, some estuaries may not have a major freshwater tributary on which to establish a landward boundary. Instead, these watersheds were delineated simply by determining the proximal area contributing to the embayment using topography. Also, several of the estuaries are located on Cape Cod and are influenced by a groundwater contributing area rather than a typical watershed. Where special circumstances dictated a deviation from the general delineation process, best professional judgment was used to determine what the most informative and useful "estuarine watershed" would be.

2.1 Determination of Seaward Boundary

The basis for the determination of the seaward boundary began by using the Massachusetts Department of Environmental Protection (MassDEP) 2010 Integrated List of Waters, also known as the 305(b) list. This data is made available as a spatial data set by the Massachusetts Office of Geographic Information (MassGIS). The data provides a spatial representation of all of the river, lake, and estuary segments assessed as part of the Integrated List of Waters. In particular, the estuary water body segments provided a useful starting point for determination of the seaward boundary of the estuarine watershed.

This starting point was, in some cases, insufficient to describe the seaward extent of the estuary for the purposes of this project. Because the goal of the project is to assess the ecological resources present in each estuary and its contributing watershed, a simplistic downstream boundary, such as that provided by the 305(b) listing, would sometimes be insufficient to encompass important estuarine resources that may exist just outside the boundary.

When appropriate, the seaward boundary was expanded to include the following important adjacent estuarine resources:

- Tidal flats;
- Shellfish suitability zones; and
- Seagrass beds.

The spatial data for tidal flats was obtained from the MassDEP Wetlands data layer. The dataset was produced using interpretation of color-infrared photography and field checked by the MassDEP Wetlands Conservancy Program. The data represents wetlands as of 2000.

Shellfish suitability zones have been mapped by the Massachusetts Division of Marine Fisheries based on their own expertise and input from local shellfish constables, commercial fishermen, and other studies of shellfish in Massachusetts. The zones are comprised of polygons representing habitats that are believed to be suitable for 10 of the common shellfish species found along the Massachusetts Coast.

Seagrass beds have been mapped by MassDEP in 1995, 2001, and for selected embayments in 2006. The primary species of interest was eelgrass (*Zostera marina*); although other submerged aquatic species were considered (*Ruppia* and some freshwater species).

The seaward boundary of each estuary was expanded to include these nearby resources as needed. In some cases, select shellfish species habitat zones extended far up and down the coast, well out of range of the influence of a given estuary, and were therefore not used to expand an estuary's seaward boundary. The same can be said of seagrass beds, which sometimes extended well out of range of the estuary.

Figure 2.1 below shows an example of the expansion of the seaward boundary of the Manchester Harbor, which was expanded to include nearby seagrass beds and shellfish habitat.

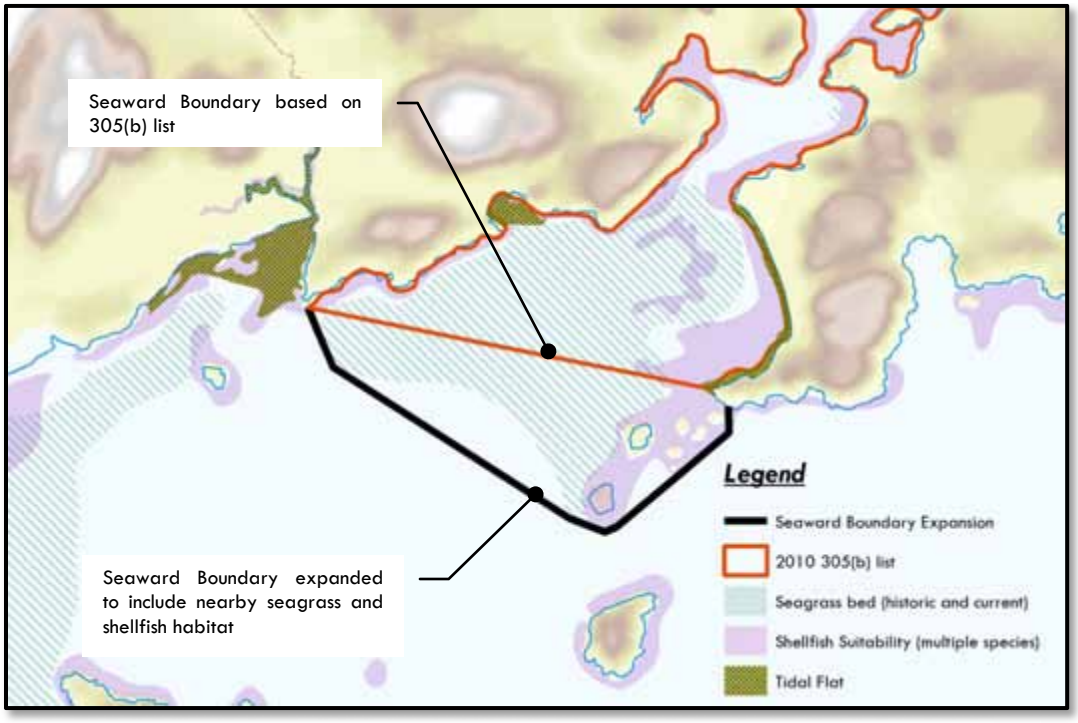


Figure 2.1 Seaward Boundary Expansion for Manchester Harbor

2.2 Determination of Landward Boundary

The intent of this Estuary Assessment and Delineation is to define not only the boundary of the estuary itself, but the relevant watershed areas that contribute to or exist within an "estuarine environment." In some cases, estuaries are fed by large rivers whose contributing areas reach far inland and could be comprised of several hundred square miles (e.g. Merrimack River, Charles

River). In these cases, large portions of the actual watershed are tributary to a major body of fresh water. While these freshwater portions of the watershed are important when considering hydrologic budgets or complete nutrient or bacterial budgets, their effects on the estuary are beyond the scope of this project. To this end, a practical landward extent of the estuarine environment was used to limit the upstream extent of the watershed and remove portions of the watershed that were not directly coastal in nature.

For estuaries with one or more significant freshwater tributary rivers, the furthest extent of tidal influence was used to determine the location of the landward boundary. Two data sources were primarily used to interpret this location:

- Maps of salt marsh locations; and
- Massachusetts General Law Chapter 91 Tidelands Jurisdiction maps.

Salt marshes were mapped using the MassDEP Wetlands data layer. The dataset was produced using interpretation of color-infrared photography and field checked by the MassDEP Wetlands Conservancy Program. The data represents wetlands as of 2000.

The Chapter 91 Tidelands Jurisdiction data was prepared by The BSC Group, Inc. and the Massachusetts Office of Coastal Zone Management (CZM) to aid state regulatory agencies with determination of Chapter 91 tidelands jurisdiction. The set of linework contains several classifications, including contemporary and inferred high water marks, landward marsh boundaries, and other historically non-landlocked tidelands that fall under Chapter 91 jurisdiction. The extent of this data was taken as an indication of the farthest upstream extent of tidal influence.

Of these two datasets, the one which extended farther inland was used to determine the landward boundary along any major freshwater tributaries of the estuary. Table 2.1 lists the freshwater tributaries to which this rule was applied.

Special considerations for landward boundary:

In some cases, an estuary or embayment did not have any major freshwater tributaries. In these cases, the watershed was directly proximal to an estuary or coastline. Some smaller freshwater, non-tidal tributaries were clearly present within this proximal area and, according to the process described above, would be excluded as non-tidal. However, because they drained directly to a salt marsh or to the ocean, rather than into a fresh water body, they were included within the estuarine watershed.

Figure 2.2 shows the north coast of the Salem Sound watershed and demonstrates the difference between exclusion/inclusion of these smaller tributaries. In this case, the dashed line shows the watershed as it would be delineated by strictly excluding all tributary area beyond the extent of tidal influence. The solid line shows the watershed boundary if smaller freshwater streams are included. The solid line is in approximate agreement with the watershed boundary shown in the report "Planning for Effective Pond Management in the Salem Sound Watershed, 2010," produced by Tufts University and Salem Sound Coastwatch.

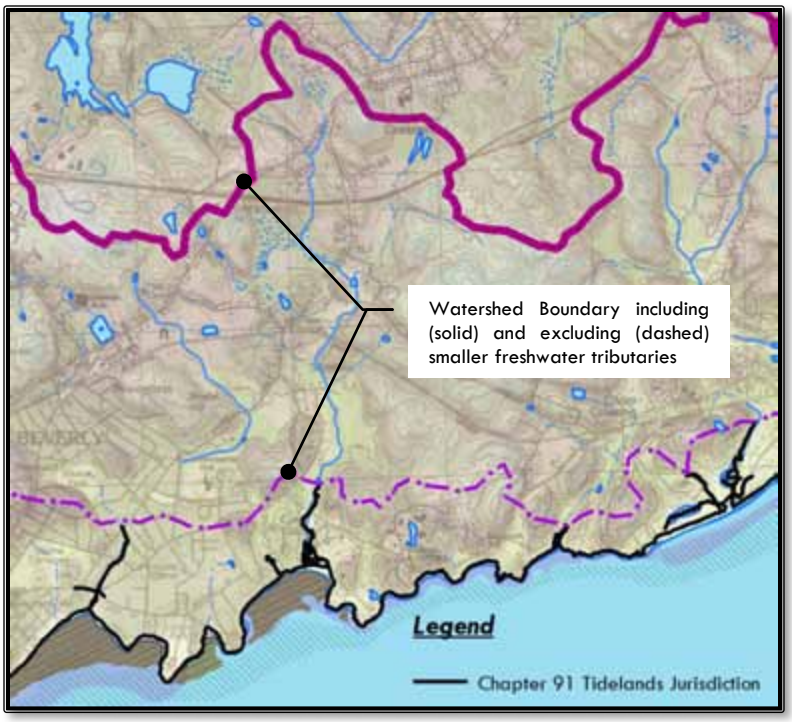


Figure 2.2 Salem Sound Estuarine Watershed Boundary: Freshwater Tributary Inclusion vs. Exclusion

Where such questions arose, pre-delineated sub-basin watersheds prepared by MassGIS and vetted by the United States Geologic Survey (USGS), Massachusetts Water Resource Commission and the Executive Office of Energy and Environmental Affairs (EOEA), were used determine whether a given tributary warranted inclusion within the estuarine watershed. If a questionable body of water did not have its own sub-basin delineated by MassGIS, and was tributary to the estuary or embayment, it would be included within Geosyntec's estuarine watershed boundary.

2.3 Delineation of Remaining Estuarine Watershed Boundary

For watersheds not located on Cape Cod, the remaining portions of the estuarine watershed boundary were delineated using topography. The primary source of topographic information was the National Elevation Dataset (NED) 1/3-arc-second topographic data produced by USGS. This topographic data was supplemented by 3-m interval elevation contours produced from the MassGIS Massachusetts Digital Elevation Model (DEM).

In certain cases the above elevation data was not detailed enough to determine the location of a watershed boundary. One such type of location is low lying salt marshes. In these cases, aerial photography was used to interpret the watershed divide using apparent ditches and channels.

The draft estuarine watershed boundaries were then compared to pre-delineated sub-basins prepared by MassGIS. Where discrepancies occurred, Geosyntec's estuarine watershed boundary was adjusted to follow the MassGIS sub-basin boundary if the MassGIS boundary was determined to be a more accurate or practical representation of the estuarine watershed.

2.4 Delineation of Cape Cod Groundwater Contributing Areas (GWCA)

Hydrologic basins on Cape Cod are dominated by groundwater flow and cannot be delineated using surface topography. The primary source of estuarine groundwater contributing areas (GWCAs) on Cape Cod is a data layer created by USGS in cooperation with USEPA. This data layer contains GWCAs generated using regional MODFLOW groundwater models of the Cape Cod aquifer system. In some cases, the seaward estuarine boundary was further modified to better tie into these existing basin boundaries.

In two cases (Namskaket/Little Namskaket Complex, Boat Meadow River/Rock Harbor Complex), detailed GWCA's are presented in reports prepared as part of the Massachusetts Estuaries Project (MEP). Maps from these reports were georeferenced and digitized by Geosyntec. For the Namskaket/Little Namskaket Complex, GWCA's from two MEP reports (Namskaket Creek and Little Namskaket Creek reports) were combined to form a single GWCA. For Boat Meadow River/Rock Harbor Complex, the MEP report only presents a GWCA for Rock Harbor. The remaining portion of the GWCA was interpreted using basins presented by the Cape Cod Commission Regional Policy Plan.

The Panes Creek/Stony Brook estuary did not have a suitable GWCA in any of these data sources. For this estuary, Geosyntec interpreted a GWCA using portions of boundaries provided in the USEPA basin dataset as well as graphical representations of groundwater recharge zones shown on the USGS Map, "Ground-water Recharge Areas and Travel times to Pumped Wells, Ponds, Streams, and Coastal Water Bodies, Cape Cod, Massachusetts." Figure 3 shows how this GWCA was interpreted.

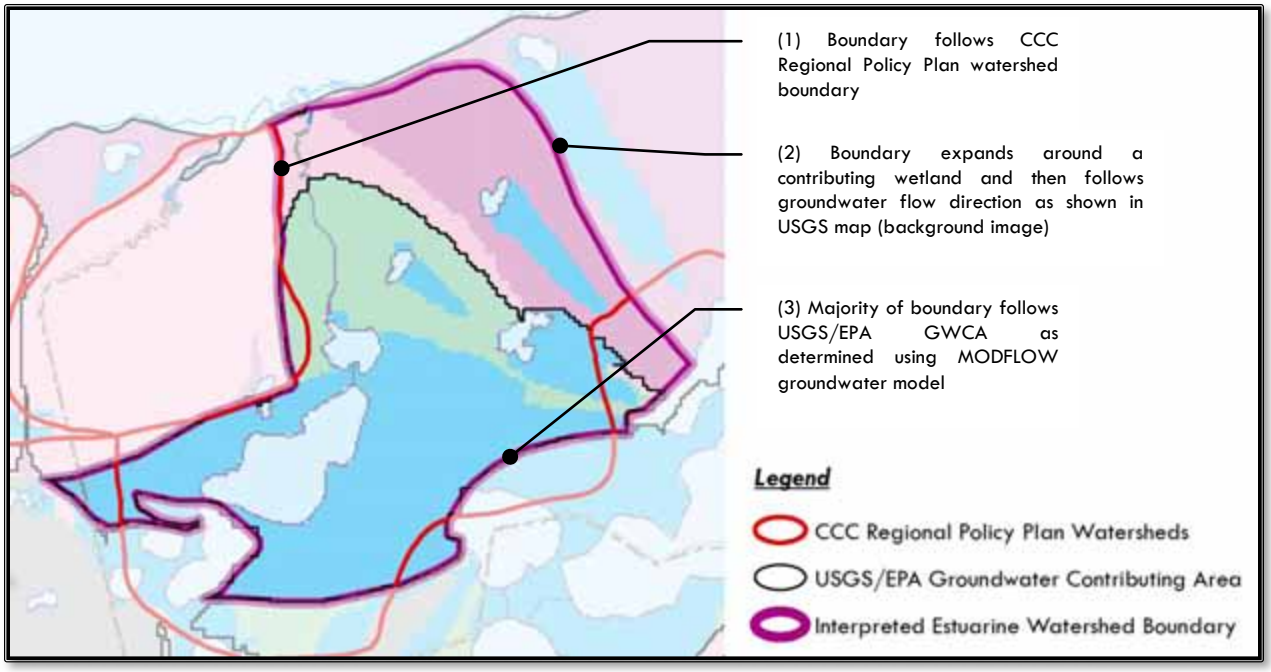


Figure 2.3 Paine's Creek/Stony Brook Watershed Boundary Interpretation

(Background Image from USGS Map, "Ground-Water Recharge Areas and Travel Times to Pumped Wells, Ponds, Streams, and Coastal Water Bodies, Cape Cod, Massachusetts")

2.5 Results of Watershed Delineation

Details on the delineation of each watershed are provided in Table 2.1. The 47 estuarine watershed boundaries are shown in Appendix B: Maps, Watershed Delineation. For all non-nested watersheds (i.e. those not made up of several smaller watersheds, i.e. Boston Harbor, Salem Sound, Plum Island Sound), the average watershed size was 10.1 square miles and the median watershed size was 8.3 square miles. The minimum watershed size was 1.1 square miles (Herring River/Herring Pond) and the maximum watershed size was 31.5 square miles (Barnstable Harbor).

Cape Cod groundwater contributing watersheds were in approximately the same size range as the other estuarine watersheds in Massachusetts. For Cape Cod watersheds, the median size was 6.6 square miles and the average size was 10.1 square miles. For other watersheds in Massachusetts, the median size was 8.6 square miles and the average size was 10.2 square miles.

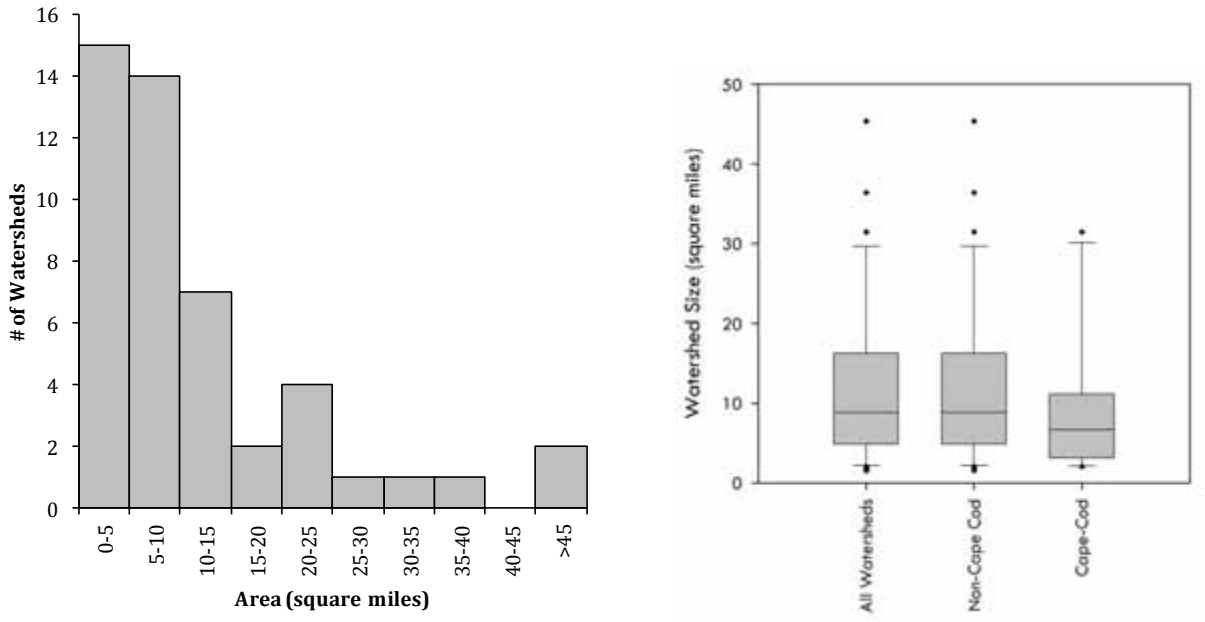


Figure 2.4 Watershed Size Statistics

(Left: Histogram, All Watersheds; Right: Box Plots, All Watersheds, Non-Cape Cod Watersheds, and Cape Cod Watersheds)

TABLE 2.1. ESTUARINE WATERSHED DELINEATION DETAILS

MBP REGION	ID	NAME	SEAWARD BOUNDARY DETAILS	LANDWARD BOUNDARY DETAILS	NOTES
Upper North Shore	1	MERRIMACK RIVER / BLACK ROCK CREEK	305(b)/Expanded (tidal flats)	Chapter 91 Tidelands (Merrimack River)	
	2	PARKER RIVER	305(b)	Salt water wetlands (Little River, Parker River, Mill Creek)	Sections of this this watershed boundary that cross low lying salt water wetlands were delineated using ditches/channels shown in aerial photography
	3	ROWLEY RIVER	305(b)	Chapter 91 Tidelands (Egypt River, Muddy Run)	Sections of this this watershed boundary that cross low lying salt water wetlands were delineated using ditches/channels shown in aerial photography
	4	IPSWICH RIVER	305(b)	Subbasins	
	5	PLUM ISLAND SOUND	305(b)/Expanded (tidal flats)	Chapter 91 Tidelands, Salt water wetlands, Subbasins	
	6	ESSEX RIVER / ESSEX BAY	305(b)	Chapter 91 Tidelands (Alewife Brook), Salt water wetlands (Essex River), Subbasins (Walker Creek)	305 (b) listing indicates that the western portion of this estuary (Hog Island Channel and Castle Island River) are not part of Essex Bay. This embayment was expanded to include these areas.
	7	ANNISQUAM RIVER	305(b)/Expanded (seagrass, shellfish)	Chapter 91 Tidelands (Little River), Subbasins	Does not include Babson Reservoir or Goose Cove Reservoir. Divide between Annisquam River basin and Gloucester Harbor basin does not necessarily mean that there is no tidal exchange between these two waterbodies and may warrant further investigation.
	8	ROCKPORT HARBOR (SANDY BAY)	Geography	Subbasins	Seaward boundary determined by connecting inflection points along the coast.
	9	GLOUCESTER HARBOR	305(b)/Expanded (shellfish)	Geography	Divide between Annisquam River basin and Gloucester Harbor basin does not necessarily mean that there is no tidal exchange between these two waterbodies and may warrant further investigation.
Salem Sound	10	MANCHESTER HARBOR	305(b)/Expanded (tidal flats, shellfish)	Chapter 91 Tidelands (East Brook/Causeway Brook)	
	11	DANVERS RIVER	305(b)	Chapter 91 Tidelands (Bass River, Porter River, Crane River), Subbasins (Waters River)	
	12	BEVERLY HARBOR	305(b)	Chapter 91 Tidelands (Bass River, Porter River, Crane River), Subbasins (Waters River)	
	13	FOREST RIVER / SALEM HARBOR	305(b)	Salt water wetlands (Forest River), Subbasins	
	14	MARBLEHEAD HARBOR	305(b)	Topography	In the absence of any major tributaries, topography determined the areas that were proximal to this estuary.
	15	SALEM SOUND	305(b)	See watersheds 10-14	Watershed boundary between Manchester Harbor and Beverly Harbor was assumed to follow existing MassGIS Subbasin boundary
Metro Boston	16	SAUGUS RIVER / PINES RIVER / LYNN HARBOR	305(b)	Chapter 91 Tidelands (Saugus River), Salt water wetlands (Shute Brook), Subbasins (Pines River)	
	17	BELLE ISLE CREEK / WINTHROP BAY	305(b)	Topography	In the absence of any major tributaries, topography determined the areas that were proximal to this estuary. Watershed divide at Logan Airport is unclear.
	18	CHELSEA CREEK / MYSTIC RIVER / CHARLES RIVER / BOSTON INNER HARBOR	305(b)	Chapter 91 Tidelands (Mystic River), Subbasins (Mill Creek/Chelsea River, Malden River)	Estuarine watershed boundary for Charles River determined by location of locks/dam
	19	NEPONSET RIVER / DORCHESTER BAY	305(b)	Chapter 91 Tidelands (Neponset River), Subbasins (Unquitty Brook)	
	20	BLACKS CREEK / QUINCY BAY	305(b)	Chapter 91 Tidelands (Blacks Creek)	
	21	BACK RIVER / FORE RIVER / HINGHAM BAY	305(b)	Chapter 91 Tidelands (Monatiquot River), Subbasins (Town River, Weymouth Back River)	
	22	WEIR RIVER / STRAITS POND	305(b)	Chapter 91 Tidelands (Weir River), Subbasins (Turkey Hill Run)	
	23	BOSTON HARBOR	305(b)	See watersheds 17-22	

TABLE 2.1. ESTUARINE WATERSHED DELINEATION DETAILS

MBP REGION	ID	NAME	SEAWARD BOUNDARY DETAILS	LANDWARD BOUNDARY DETAILS	NOTES
South Shore	24	LITTLE HARBOR	305(b)/Expanded (shellfish)	Chapter 91 Tidelands (Richardsons Brook)	
	25	COHASSET HARBOR	305(b)/Expanded (seagrass, shellfish)	Chapter 91 Tidelands (Bound Brook), Subbasins (James Brook)	
	26	SCITUATE HARBOR	305(b)/Expanded (tidal flats, shellfish)	Chapter 91 Tidelands (Satuit Brook)	
	27	NORTH RIVER / SOUTH RIVER	305(b)/Expanded (tidal flats)	Salt water wetlands (North River, South River)	
	28	GREEN HARBOR	305(b)/Expanded (tidal flats)	Subbasins (Duxbury Marsh, West Brook)	
	29	BLUEFISH RIVER / BACK RIVER / DUXBURY BAY	305(b)	Chapter 91 Tidelands (Jones River, Smelt Brook)	
	30	JONES RIVER / KINGSTON BAY	305(b)	Chapter 91 Tidelands (Town Brook, Eel River)	
	31	EEL RIVER / PLYMOUTH HARBOR	305(b)/Expanded (shellfish)	Subbasins	
	32	ELLISVILLE HARBOR	305(b)	Subbasins	Potentially exists in sandy aquifer (Plymouth-Carver region). Topography was not effective at delineating a boundary, so existing MassGIS Subbasin boundary was used.
	33	GREAT HERRING POND / BOURNEDALE	None	Topography, Location of anadromous fish run	In the absence of tidal influence in this system, watershed was delineated to encompass an important herring run that was the basis for this watershed's inclusion in the study.
Cape Cod	34	SANDWICH HARBOR	305(b)/Expanded (tidal flats)	USGS/EPA GWCA	
	35	SCORTON CREEK	Geography	USGS/EPA GWCA	
	36	BARNSTABLE HARBOR	Adjusted to line up with USGS/EPA GWCA	USGS/EPA GWCA	
	37	CHASE GARDEN CREEK	Adjusted to line up with USGS/EPA GWCA	USGS/EPA GWCA	
	38	SESUIT CREEK / SESUIT HARBOR	Geography	USGS/EPA GWCA	
	39	QUIVETT CREEK	305(b)	USGS/EPA GWCA	
	40	PAINE'S CREEK / STONY BROOK	305(b)	Interpreted by Geosyntec	Eastern GWCA boundary was interpreted by Geosyntec using a USGS map of groundwater recharge areas ("Ground-water Recharge Areas and Traveltimes to Pumped Wells, Ponds, Streams, and coastal Water Bodies, Cape Cod, Massachusetts.")
	41	NAMSKAKET CREEK / LITTLE NAMSKAKET CREEK	Massachusetts Estuaries Project Report	Massachusetts Estuaries Project Report	
	42	BOAT MEADOW CREEK / ROCK HARBOR	Massachusetts Estuaries Project Report/Cape Cod Commission Regional Policy Plan	Massachusetts Estuaries Project Report/Cape Cod Commission Regional Policy Plan	
	43	HERRING RIVER / HERRING POND	305(b)		
	44	HERRING BROOK / GREAT POND	305(b)		
	45	WELLFLEET HARBOR	305(b)/Adjusted to line up with USGS/EPA GWCA	USGS/EPA GWCA	
	46	PAMET RIVER / LITTLE PAMET RIVER	Geography	USGS/EPA GWCA	
	47	PROVINCETOWN HARBOR	Adjusted to line up with USGS/EPA GWCA	USGS/EPA GWCA	

3. SELECTION OF ENVIRONMENTAL INDICATORS

Geosyntec developed a list of indicators that can be used to evaluate the condition of each estuary with respect to MBP's three management priorities. The list of indicators was generally split into two broad categories: environmental stressors and estuarine resources. Stressors include any factors that cause or indicate impairment of the watershed, such as high-intensity land uses (e.g. industrial, agriculture, etc.), impervious surfaces, population density, 303(d) impairment listings, etc. Resources include metrics which indicate the presence of important ecological resources, such as eelgrass beds, shellfish species count and shellfish bed extent, anadromous fish presence, and salt marsh area. The indicators were categorized in this manner to provide information about the reasons for the various priority level rankings for each estuary. For instance, two watersheds of equal priority may be classified differently based on their respective amounts of stressors and resources (one watershed receiving a high priority due to the need to manage anthropogenic impacts, and the other receiving a high priority due to the need to protect sensitive valuable estuarine resources).

Selection of the indicators was guided by the following concepts:

1. Indicators should consist of geospatial data that is freely distributed and vetted via existing government agencies to the maximum extent practicable;
2. The spatial extent of the indicators must cover the entire project area;
3. The indicators should have a high probability of being updated by those agencies on a regular basis so that similar analyses can be performed in the future;
4. The indicators should not require a significant amount of field work or other research that could become cost- and/or schedule-prohibitive to the analysis; and
5. Important indicators not readily available will be synthesized using other freely available data sources and a modeling approach (e.g. stormwater runoff volume calculated using soils data, land use data, and rainfall statistics. See Appendix A).

Geosyntec identified 15 stressor indicators and 7 resource indicators. Table 3.1 and 3.2 list the indicators, their source, and the specific management priority to which they apply. The extent and location of a select set of the stressor and resource indicators has been mapped in Appendices C and D. The following is a brief discussion of each indicator, the data used to measure the indicator, and the rationale for its inclusion in the study:

- **High Intensity Land Use**. High intensity land use is considered to be all residential, commercial, industrial, agricultural, and transportation related areas as delineated in the 2005 Massachusetts Land Use dataset. These types of land uses are characterized by anthropogenic influence and often lead to high rates of stormwater runoff, bacterial and nutrient contamination, and other types of non-point-source pollution. This indicator is related to other ecological stressors, such as road crossings and restrictions (due to the increased presence of roads in these land use areas), encroachment upon wetlands, and an increased presence of wastewater discharges.

- **Annual Stormwater Discharge**. Annual stormwater discharge is closely related to an increased load of bacterial and nutrient contamination to the receiving estuary. High rates of stormwater runoff can lead to increased transport of silt, sediment, and nutrients (especially from agricultural and residential areas), and bacteria (especially from highly developed, impervious areas). In some cases, stormwater runoff can have an effect on the frequency of combined sewer overflows, a significant source of bacterial and nutrient contamination. The rate of stormwater runoff is determined by several factors, including land use type, soil hydrologic group, and rainfall amount. Geosyntec utilized the NRCS Curve Number method and 50 years of local rainfall statistics to estimate the annual volume of stormwater discharge in each estuary (see Appendix A).
- **Impervious Area**. Impervious area is closely associated with increased stormwater runoff and higher concentrations of non-point-source contaminants within the runoff. By preventing infiltration, impervious areas increase the volume, and often times the erosive velocities, of stormwater. Contaminants build up on these surfaces between rainfall events and are easily washed off into receiving water bodies. Impervious area is also closely associated with other ecological stressors such as high intensity land use and population density
- **Population**. Population and population density are direct indicators of the extent of anthropogenic influence on an estuarine watershed. Increased population is an indicator of the presence of high intensity residential and commercial land uses, as well as impervious area. These factors can lead to significant increases in stormwater runoff. High-population areas can lead to increased rates of wastewater discharge, either in the form of wastewater treatment plants or septic system use. Population was determined using 2010 US Census data.
- **Wastewater**. Wastewater is a direct source of nutrient and bacterial pollution to an estuarine receiving body. Sources of wastewater can include wastewater treatment plant direct discharges to surface water, discharges to groundwater, and septic systems. Some wastewater treatment plant systems may receive wastewater from areas outside of the estuarine watershed in which they are located; meaning the impact from these wastewater sources may be greater than the population within the watershed would indicate.

  While these wastewater sources often have an impact on their receiving bodies, there are several factors that can mitigate the severity of the impact. The quality of treatment performed in any of these wastewater systems will clearly lessen any impacts to the receiving water body, especially if the system includes some type of 'tertiary' treatment to remove nutrients (i.e. nitrogen). Additionally, the tidal flushing characteristics of the estuary will have a large effect on the severity of the impact, with faster-flushing water bodies being better suited to receive wastewater discharge.

  - Wastewater discharges to surface water: These sources of wastewater take the form of wastewater treatment plants that directly discharge to a surface water body. Permitted treatment plants associated with sewerage systems were identified using the EPA's Envirofacts Warehouse database. Permitted flowrates for each system were also obtained from the database and considered to be an indicator of the magnitude of the discharge, although typical flows from a given

treatment plant may be less than the permitted flowrate. Locations of outfall pipes were determined using coordinates provided in the pipe schedule portion of the EPA database or from descriptions of the receiving waters, and these locations were used to determine whether the plant discharges to the estuary in question.

- Wastewater discharges to groundwater: These sources of wastewater can result from community septic systems, institutional septic systems, or wastewater treatment plants that discharge to the groundwater rather than surface water. They are distinct from residential septic systems in that they are large enough to require an individual permit and are thus more readily quantifiable. These systems were identified using MassDEP Groundwater Discharge Permits database and represent systems with discharges in excess of 10,000 gallons per day.
- Septic systems: Septic systems can cause significant impacts to estuarine eutrophication via transport of nitrogen, a limiting nutrient in saline environments, from septic systems into the groundwater. A specific estimate of the presence of septic systems within a given estuarine watershed would require significant documentation of installation and pumping records available at various town board of health offices, an effort which is beyond the scope of this project. Instead, towns were surveyed by MBP regarding whether there was no, some, or total use of septic systems for onsite wastewater treatment. These results were combined with estimates of population density to estimate the number of residents within a given area that may be using a septic system. An average per-capita water use of 69.3 gal/day, provided in the EPA "Onsite Wastewater Treatment System Manual," was used to estimate a daily flow rate of wastewater into the groundwater.

- **303(d) Impairments:** 303(d) impairments indicate existing stress on the ecological capabilities of rivers, streams, lakes, and estuaries. MassDEP provides spatial representation of its 2010 303(d) list of impairments in two ways: linear representation for rivers and streams, and areal representation for lakes and estuaries. Water bodies can be listed for a wide range of impairments, of which a subset was selected to represent the specific management priorities (bacterial and nutrient contamination) of this project. A water body listed as impaired for "Ammonia," "Phosphorus," "Chlorophyll-a," "Excess Algal Growth," or "Nutrient/Eutrophication Biological Indicators" was considered to be impaired with respect to nutrients, while a water body listed as impaired for "Fecal Coliform" was considered to be impaired with respect to bacteria.
- **Designated Shellfish Growing Area Classification:** Shellfish growing areas within the coastal waters of Massachusetts are classified by the Department of Fish and Game's Division of Marine Fisheries for their suitability for shellfish harvest for human consumption. The most recent available data is reflective of conditions in 2009. Each Designated Shellfish Growing Area (DSGA) can be classified in six categories ranging from "Approved" to "Prohibited." The amount of prohibited or restricted DSGA within an estuary was considered to be an indication of an existing stressor on the system.
- **Number of Impoundments Causing Fish Passage Barriers:** Impoundments along streams and waterways can potentially restrict or prevent the passage of anadromous fish.

For this reason, the number of impoundments that cause a fish passage barrier are considered a stressor with respect to Management Priority 3 (Improve the Continuity of Estuarine Habitats). However, impoundments can cause other environmental stressors beyond fish passage barriers, such as increased stream temperatures and a disruption of natural sediment transport.

The number and location of each impoundment within a given estuarine watershed was determined using an inventory provided by the Massachusetts Office of Dam Safety. Often times, the estuarine watershed boundary would end just downstream of an impoundment, due to the impoundment's restriction of tidal flow, which was used as an indicator of the furthest upstream extent of the estuarine watershed (see Section 2.2). In these cases, a dam or impoundment was counted in the estuarine watershed due to its direct impact, even though it technically fell outside of the watershed boundary.

The fish passage impacts of a given dam or impoundment may have already been addressed by the implementation of fish ladders or other fish passage structures. In these cases, the dams were removed from the count of impoundments within the estuarine watershed. Dams with fish passage structures were identified using a fish passage structure inventory prepared by MA Department of Fish and Game.

- **Number of Stream Crossings:** Road crossings over streams and rivers can cause impediments to anadromous fish passage. Elevated culverts, blocked culverts, strong velocities, and other factors can prevent the upstream migration of fish at these sites. Significant field work is necessary to document and verify all road crossings within an estuarine watershed, and is beyond the scope of this project (however it has been performed by watershed groups in select watersheds, such as the North and South River). Instead of field documentation of all road crossings, the Massachusetts Department of Transportation statewide roads shapefile was intersected with a linear representation of hydraulic features (Networked Hydro Centerlines for non-Cape Cod areas, and the National Hydrography Dataset for Cape Cod). Identified potential road crossings were checked against USGS topographic maps and aerial imagery to determine if a potential road crossing was likely to exist or was an artifact of the intersection method (such as a road and stream running parallel which may intersect in their spatial data due to mapping inaccuracies but do not represent an actual stream crossing).

  If a road crossing intersected an area of salt marsh, it was also given the additional classification of a road crossing within a tidal area. Beyond the aforementioned effects of road crossings on fish passage, these road crossings within tidal areas may cause additional stress due to their restriction on the natural exchange of tidal flows upstream of the crossing.

- **Salt Marsh:** Salt marshes are one of the important resources being targeted by MBP's management efforts. Salt marshes provide important water quality benefits via filtering of upstream waters, as well as habitat for shorebirds, crustaceans, and other biota. Salt marshes have been impacted by pollution, encroachment, filling, and restriction of normal tidal flushing. The extent of salt marsh was quantified using the MassDEP wetlands data layer.

- **Tidal Flats:** Tidal flats are estuarine habitat areas that are periodically exposed to air at low tide. They are important habitat for invertebrates and crustaceans that serve at the basis of the food chain for many species of fish and shorebirds. The extent of tidal flats was quantified using the MassDEP wetlands data layer.
- **Seagrass:** Seagrass is a group of important submerged aquatic macrophytes comprised of eelgrass (*Zostera marina*) and other species. Seagrass provides important fish and crustacean habitat, providing cover, food, and spawning habitat. Seagrass beds have historically been degraded due to the light-limiting effect of increased turbidity and eutrophication.

  MassDEP has mapped seagrass extent for years 1995, 2001, and 2006 using a combination of aerial imagery analysis and field confirmation. These datasets were used to determine an average extent of seagrass within each estuary over the decade-long period.
- **Shellfish Habitat:** Shellfish habitat within each estuary was determined using shellfish suitability areas delineated in the Massachusetts Environmental Sensitivity Index. These habitat areas are distinct from the regulatory Designated Shellfish Growing Areas described above, in that they represent the best estimate of potential habitat of the shellfish species present on the Massachusetts coast. The species listed in the dataset include American Oyster, Bay Scallop, Blue Mussel, European Oyster, Ocean Quahog, Quahog, Razor Clam, Sea Scallop, Soft-shelled Clam, and Surf Clam. The dataset was derived by the Massachusetts Division of Marine Fisheries with input from local shellfish constables, fishermen, and historic maps and studies of shellfish. Shellfish habitat was measured in species-acres for this study, meaning multiple species could be counted for the same area if their potential habitats overlapped, and allowing for species diversity to be accounted for in the analysis.
- **Shorebird Habitat and Nesting Sites:** Shorebird habitat within each estuary was determined using habitat areas delineated in the Massachusetts Environmental Sensitivity Index (ESI). Shorebird habitat was measured in species-acres for this study, meaning multiple species could be counted for the same area if their potential habitats overlapped, and allowing for species diversity to be accounted for in the analysis. Nesting sites were also identified in the ESI and counted for their presence in each estuarine watershed. Shorebird habitat is closely related to other estuarine habitats like salt marsh and tidal flats, which provide food, cover, and nesting sites for shorebirds.
- **Length of Anadromous Fish Runs:** The Massachusetts Division of Marine Fisheries has developed a database listing the beginning and end points of various known anadromous fish runs on the Massachusetts coast. In order to quantify the length of these runs, the hydraulic length between each start and end point was traced using a linear representation of hydraulic features (Networked Hydro Centerlines for non-Cape Cod areas, and the National Hydrography Dataset for Cape Cod). Runs were traced on a per-species basis, and accounted for the following species: Alewife, American Shad, Atlantic Sturgeon, Blueback Herring, and Rainbow Smelt. The length of the fish run was considered to be the total length both outside and inside the estuarine watershed, unlike

other indicators in this study which were calculated based only on the indicator's presence within the estuarine watershed boundary. The rationale for this difference was that fish runs could extend miles upstream, and a very large and ecologically important fish run could start in a relatively small estuarine watershed, meaning the full size and importance of the run would not be captured by only quantifying the portion lying within the watershed boundary. Anadromous fish runs were measured in species-miles for this study, meaning multiple species could be counted for the same length of stream if their runs overlapped, and allowing for species diversity to be accounted for in the analysis.

TABLE 3.1. List of Stressor Indicators

Indicator	Raw Statistic	Weighted Statistic	Related Management Priority	Source	Details
High Intensity Land Use (Residential, Commercial, Agricultural, etc)	Area	Percentage watershed land area	Reduce bacterial contamination/eutrophication	MassGIS	Residential, commercial, industrial, agricultural, and transportation polygons from the Land Use (2005) data set are classified as high intensity
Approximate Annual Stormwater Discharge	Annual Volume	Volume per watershed land area	Reduce bacterial contamination/eutrophication	MassGIS / USDA	Annual stormwater discharge is estimated using the Curve Number method. Curve numbers were be chosen for a given area based on soil hydrologic group and land use type. The MassGIS Land Use (2005) layer was intersected with the USDA soils map to create a collection of polygons with both land use and hydrologic group attributes. These polygons were assigned appropriate curve numbers and an annual storm water discharge for each polygon was calculated. Finally, the sum of all storm water discharges from individual polygons in a given watershed was summed to estimate the total watershed annual runoff.
Impervious Area	Area	Percentage of watershed land area	Reduce bacterial contamination/eutrophication	MassGIS	Data is a composite of MassGIS Impervious Surface rasters: imp_cape1, imp_cape2, imp_cape3, imp_se1, imp_se2, imp_se4, imp_ne1, imp_ne2, imp_ne3, imp_ne4, imp_ne5
Population	Count	Density (Population per area)	Reduce bacterial contamination/eutrophication	US Census Bureau	Census2010 blocks were used to create a population density raster. The average population density value will be multiplied by the land area to estimate a watershed population.
Wastewater Treatment Plants (discharging to surface waters)	Count and Permitted Flowrate	NA	Reduce bacterial contamination/eutrophication	USEPA	Dataset was created by searching EPA's Envirofacts Warehouse. The data was obtained by doing a search of the Permit Compliance System (PCS) database. Facility information was selected for the state of Massachusetts. All facilities with the SIC code "4952: SEWERAGE SYSTEM" were selected. Latitudes and Longitudes supplied by the PCS database were used to create a shapefile of these facilities. The PCS data also contains permitted discharge rate for each plant.
Wastewater discharges to groundwater	Count and Permitted Flowrate	NA	Reduce bacterial contamination/eutrophication	MADEP	Data obtained from MassDEP Ground Water Discharge Permits available on MassGIS. The data contains groundwater discharge permits for discharges in excess of 10,000 gallons per day. For the purposes of this project, the data were filtered to only include permits classified as "Sanitary Discharge" or "Other." Car washes and laundromats were excluded.
Septic System Use	Approximate population served by on-site treatment systems	NA	Reduce bacterial contamination/eutrophication	MassBays, US Census Bureau	Town Sewering information has been provided by Massachusetts Bays Program. Shapefile classifies Towns based on their amount of sewering as "all", "some", or "none." This will be used to determine a percentage of the estuarine watershed that is serviced by on-site treatment systems. Population data will then be used to determine the approximate population served by septic systems and other on-site treatment systems.
303(d) Impairment for Nutrients (Estuary)	Area of impaired waters	Area of impaired waters per area of classified waters	Reduce bacterial contamination/eutrophication	MADEP 2010 305(b) list	
303(d) Impairment for Bacteria (Estuary)	Area of impaired waters	Area of impaired waters per area of classified waters	Reduce bacterial contamination/eutrophication	MADEP 2010 305(b) list	
303(d) Impairment for Nutrients (Tributaries)	Length of impaired waters	Length of impaired waters per length of classified waters	Reduce bacterial contamination/eutrophication	MADEP 2010 305(b) list	

TABLE 3.1. List of Stressor Indicators

Indicator	Raw Statistic	Weighted Statistic	Related Management Priority	Source	Details
303(d) Impairment for Bacteria (Tributaries)	Length of impaired waters	Length of impaired waters per length of classified waters	Reduce bacterial contamination/eutrophication	MADEP 2010 305(b) list	
Designated Shellfish Growing Area Classification	Area of each DSGA class	Percentage of open water covered by each DSGA class	Protect/Restore Sensitive Habitats	Division of Marine Fisheries	The status for the estuary will be determined using the Division of Marine Fisheries "Designated Shellfish Growing Area (DSGA)" classification polygons. DSGAs fall into six categories ranging from Approved to Restricted.
Tidal Restriction	Area of restricted marsh	Ratio of restricted to unrestricted marsh and average severity of restriction	Improve continuity of estuarine habitats	Umass Amherst	Data obtained from Umass Amherst CAPS (Conservation Assessment and Prioritization System) data. Severity of tidal restriction has been scored on a sliding scale. The average value for the watershed will be calculated, as well as the area of salt marsh that intersects the tidal restriction layer (e.g. "The watershed contains 860 acres of salt marsh, 340 of which experience tidal restriction. The average severity of the restrictions in this watershed is ranked 5.5 out of 10."
Number of Impoundments causing fish passage barriers	Count	Count per watershed land area	Improve continuity of estuarine habitats	Massachusetts Office of Dam Safety / MA Department of Fish and Game	The Massachusetts Office of Dam Safety dam inventory will be used to locate impoundments. In many cases, the dam location may be just outside of the estuarine subwatershed boundary. A small buffer will be applied to the watershed polygons to ensure that these dams are counted. Then, fish passageway information from MA Department of Fish and Game will be used to determine which of the dams do not pose a fish passage barrier.
Number of Stream Crossings	Count	Count per watershed land area	Improve continuity of estuarine habitats	MassGIS/USGS Geosyntec	Massachusetts DOT road centerlines were intersected with the National Hydrography Dataset Flowlines to produce a stream crossings layer. Quality control and verification of this data will commence after finalization of the watersheds.

TABLE 3.2. List of Resource Indicators

Indicator	Raw Statistic	Weighted Statistic	Related Management Priority	Source	Details
Salt Marsh	Area	Percentage of total watershed area	Protect/Restore Sensitive Habitats	MassGIS	MassGIS Land Use (2005) layer used to determine the extent of salt marsh.
Tidal Flat	Area	Percentage of total watershed area	Protect/Restore Sensitive Habitats	MADEP/MassGIS	Tidal flat areas obtained from MassDEP Wetlands Datalayer, available on MassGIS
Seagrass	Area	Percentage of estuary open-water area	Protect/Restore Sensitive Habitats	MADEP/MassGIS	Seagrass bed locations from 1995, 2001 and 2006 as mapped by MADEP and availible via MassGIS
Shellfish Habitat	Area per species	Percentage of estuary open-water area per species	Protect/Restore Sensitive Habitats	Division of Marine Fisheries	Shellfish Suitability Areas, available via MassGIS
Shorebird Habitat	Area per species	Percentage of total watershed area per species	Protect/Restore Sensitive Habitats	CZM MORIS	Shorebird habitat is obtained from Environmental Sensitivity Index (ESI), availible from CZM MORIS
Shorebird Nesting Sites	Count	Count per total watershed area	Protect/Restore Sensitive Habitats	CZM MORIS	Shorebird nesting sites are obtained from Environmental Sensitivity Index (ESI), availible from CZM MORIS
Length of Anadromous Fish Runs	Length per species	NA	Protect/Restore Sensitive Habitats	MassGIS/MA Department of Fish and Game/Geosyntec	Massachusetts Division of Marine Fisheries has developed a collection of points describing various features of anadromous fish habitat. A subset of these points are classified as beginnings or ends of anadromous fish runs. Geosyntec has used these start/end points, as well as the MA state hydrography network and the National Hydrography Dataset, to trace the anadromous fish runs that intersect the study area. Length of a fish run will include any segments of run that extend beyond the estuarine watershed boundary.

4. ANALYSIS OF INDICATORS

Indicators were analyzed using spatial analysis to determine the extent of their presence within each watershed. First, the raw quantity of a given indicator was measured (for instance, acres, miles, count, etc.). Then, the quantity was normalized to some aspect of the estuarine watershed size in order to compare values between the watersheds and not favor larger estuarine watersheds:

- Indicators that were solely dependent on water (such as shellfish habitat, seagrass extent) were normalized to the area of open water within the estuarine watershed boundary;
- Indicators that were solely dependent on land (land use, impervious area, population density, etc.) were normalized to the area of land within the estuarine watershed boundary;
- Indicators that existed in both open water and on land, or in transitional areas, were normalized to the entire area within the estuarine watershed boundary (such as salt marsh, tidal flat, shorebird habitat);
- The three types of wastewater sources were quantified in millions of gallons per day (MGD) to allow for comparison between them, but were not normalized for any aspect of estuarine watershed size; and
- Anadromous fish runs were not normalized for any aspect of estuarine watershed size.

After being normalized, the indicator statistics were ranked and assigned a score based on the quartile in which they fell. In general, the overall 'scores' presented in this comparative analysis were calculated as follows:

1. Watersheds were ranked based on the raw statistic calculated for each indicator;
2. After being ranked, the watersheds were assigned a grade of A through D based on the quartile (25%) in which they fell;
3. For a stressor indicator, the top quartile (those with the highest value for the stressor) was assigned grade D, the second quartile assigned grade C, and so on;
4. For a resource indicator, the top quartile (those with the highest value for the resource) was assigned grade A, the second quartile assigned grade B, and so on;
5. Numerical values were assigned to each grade. For stressors, D = 4, C = 3, etc. For resources, A=4, B=3, etc.;
6. A stressor and resource score for each watershed was calculated by summing the numerical grade values associated with the indicators for that watershed; and
7. A score for each of the three management priorities for each watershed was calculated by summing the numerical grade values associated with the indicators associated with the given management priority (i.e. for Management Priority 3, a score was calculated by summing the scores for Number of Crossings, Number of Crossings in Tidal Areas, Length of Anadromous Fish Runs, etc.).

The results of the scoring are tabulated in "Appendix E, Results of Estuarine Watershed Characterization."

The scores were then comparatively analyzed in the following groupings:

- Stressors vs. Resources, among the entire study area;
- The three Management Priorities, among the entire study area;
- Stressors vs. Resources, among watersheds within a specific planning area; and
- The three Management Priorities, among watersheds within a specific planning area.

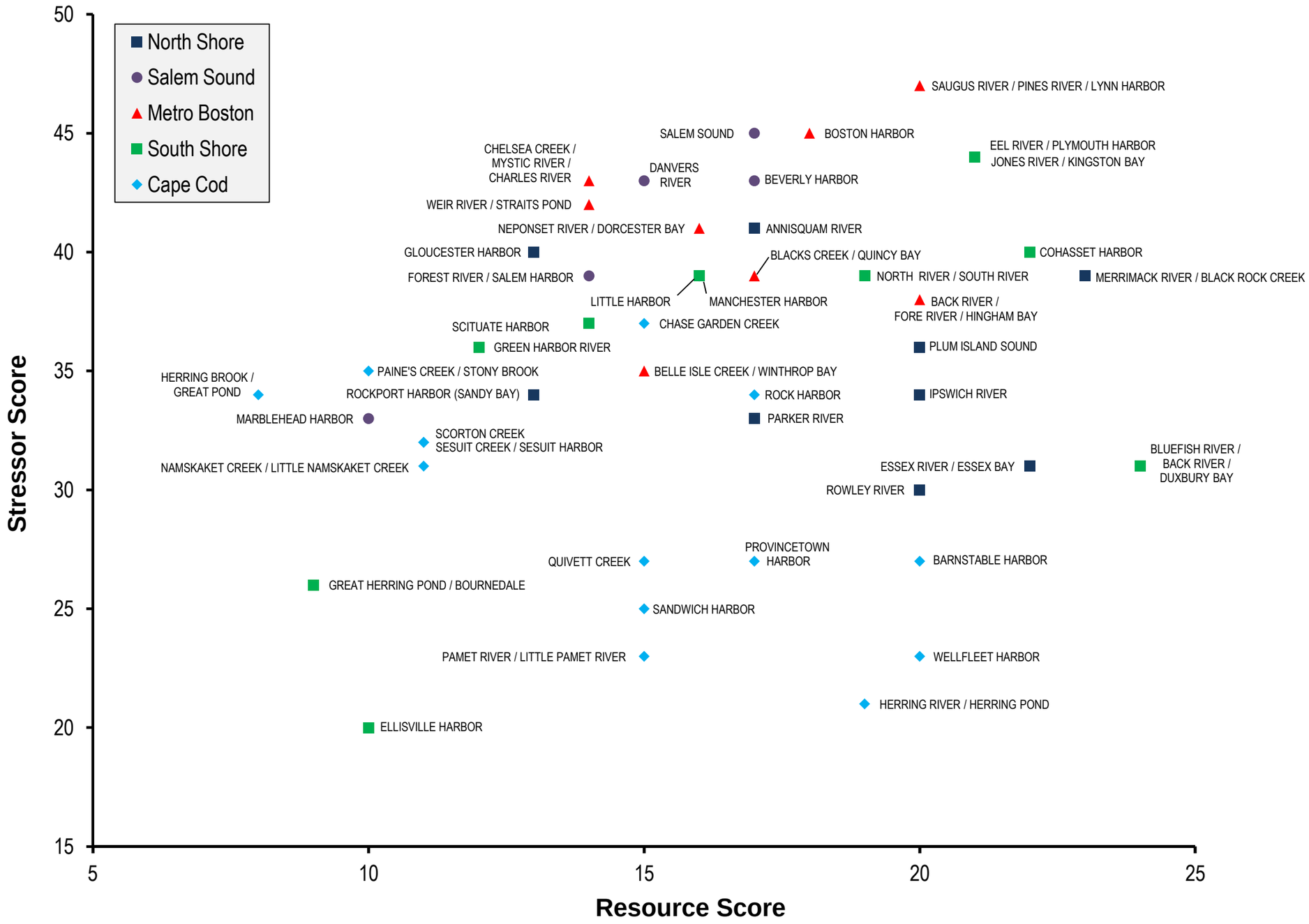
4.1 Analysis of Stressors vs. Resources

A stressors vs. resources comparative analysis was performed by calculating the total scores from all the indicators in the two categories. High scores represent a high presence of stressors and resources within a given estuarine watershed. The total scores for the two categories were plotted on two axes, so that watersheds that fall in the bottom left of the plot have low presence of both stressors and resources, and therefore low management priority, while indicators in the top right of the plot have a high presence of both stressors and resources, and therefore a high management priority.

Figure 4.1 shows the distribution of the two types of scores plotted on separate axes for resources and stressors. Total scores for resources ranged from 8 to 24. Total scores for stressors ranged from 20 to 48. Figure 4.1 shows that, among all 47 watersheds, Ellisville Harbor is the estuary with the lowest priority based on this scoring system, while Eel River/Plymouth Harbor, Jones River/Kingston Bay, and Saugus River/Pines River/Lynn Harbor have the highest priority. As a region, Metro Boston estuarine watersheds fall into high priority zones, and the high priority is not only caused by the high anthropogenic influence in the region, but also because of the presence of important resources. Cape Cod estuarine watersheds appeared, as a group, to be in the lowest priority range, although some individual watersheds from other regions showed even lower priority. The South Shore was the most varied region in terms of both the reasons for and magnitude of their management priority.

Figure 4.1
Resource Rank vs. Stressor Rank

Geosyntec Consultants, Inc.



Appendix F shows a map of the estuarine watersheds in the study, color coded according to the rank they received in stressors and resources. The watersheds were assigned a color and category of very low priority, low priority, moderate priority, high priority, and very high priority according to the matrix shown in Figure 4.2 below.

STRESSOR SCALE					
	D	(D,D) Moderate Priority	(C,D) Moderately High Priority	(B,D) High Priority	(A,D) High Priority
	C	(D,C) Moderately Low Priority	(C,C) Moderate Priority	(B,C) Moderately High Priority	(A,C) High Priority
	B	(D,B) Low Priority	(C,B) Moderately Low Priority	(B,B) Moderate Priority	(A,B) Moderately High Priority
	A	(D,A) Low Priority	(C,A) Low Priority	(B,A) Moderately Low Priority	(A,A) Moderate Priority
		D	C	B	A
		RESOURCE SCALE			

Figure 4.2 Resource/Stressor Matrix

The same analysis was then repeated comparing only the watersheds in a given MBP region, rather than all watersheds in the study area. In this analysis, the assigning of quartile based ranks was based only on the watersheds within a region. This allows for a group of watersheds, such as Cape Cod, which were previously ranked low priority among all the watersheds in the study, to be separated out so that the watersheds with the highest priority in the region can be determined. Appendix G shows maps of each region and the stressor vs. resource rank associated with them.

4.2 Analysis of Individual Management Priorities

Scores for the three management priorities were determined by adding together the scores from individual indicators that were assigned to each management priority. Table 4.1 below lists the indicators included in each management priority. Stressors are labeled with an (S) and resources with an (R).

Table 4.1 Indicators Used to Calculate Management Priority Score

MANAGEMENT PRIORITY 1: Reduce bacterial contamination, eutrophication	MANAGEMENT PRIORITY 2: Protect and restore sensitive estuarine habitat	MANAGEMENT PRIORITY 3: Improve the continuity of estuarine habitats
High Intensity Land Use (S)	Designated Shellfish Growing Area Classification (S)	Number of Impoundments causing Fish Passage Barriers (S)
Annual Stormwater Discharge (S)	Salt Marsh Extent (R)	Number of Stream Crossings (S)
Impervious Area (S)	Tidal Flat Extent (R)	Length of Anadromous Fish Runs (R)
Population (S)	Seagrass Extent (R)	
Wastewater (S)	Shellfish Habitat (R)	
303(d) Impairments (S)	Shorebird Habitat (R)	
	Shorebird Nesting Sites (R)	

Appendix F shows maps of the scores and ranks of each watershed with respect to the three management priorities. The maps show that watersheds with a high priority for MP1 are mostly located in Salem Sound and Boston Harbor Regions. MP2 scores and rankings are well distributed along the coast and high priority watersheds for MP2 do not appear to be concentrated in any specific region. High priority areas for MP3 are mostly located in North Shore and Salem Sound and priority tends to lessen toward Cape Cod.

The Management Priority analysis was repeated comparing only the watersheds in a given MBP region. Table 4.2 below lists the highest and lowest priority watersheds associated with each Management Priority. Appendix G contains maps that highlight each planning area and display the scores associated with each Management Priority for each watershed in the region.

Table 4.2 Regional Management Priority Results: Highest and Lowest Priority Estuaries

Region	MANAGEMENT PRIORITY 1: Reduce bacterial contamination, eutrophication		MANAGEMENT PRIORITY 2: Protect and restore sensitive estuarine habitat		MANAGEMENT PRIORITY 3: Improve the continuity of estuarine habitats	
	High Priority	**Low Priority**	**High Priority**	**Low Priority**	**High Priority**	**Low Priority**
North Shore	Gloucester Harbor	Rowley River	Merrimack River/Black Rock Creek	Parker River; Ipswich River; Rockport Harbor (Sandy Bay)	Parker River; Annisquam River	Rockport Harbor (Sandy Bay)
Salem Sound	Salem Sound	Forest River/ Salem Harbor	Forest River/ Salem Harbor	Marblehead Harbor	Salem Sound	Marblehead Harbor
Metro Boston	Neponset River/ Dorchester Bay	Blacks Creek/ Quincy Bay	Back River/ Fore River/ Hingham Bay; Saugus River/ Pines River/ Lynn Harbor	Chelsea Creek/ Mystic River/ Charles River/ Boston Inner Harbor	Saugus River/ Pines River/ Lynn Harbor	Neponset River/ Dorchester Bay
South Shore	Eel River/ Plymouth Harbor	Ellisville Harbor	Bluefish River/ Back River/ Duxbury Bay	Great Herring Pond/ Bournedale	North River/ South River	Ellisville Harbor
Cape Cod	Chase Garden Creek	Pamet River/ Little Pamet River	Herring River/ Herring Pond	Herring Brook/ Great Pond	Sesuit Creek/ Sesuit Harbor; Quivett Creek	Provincetown Harbor

4.3 Analysis Discussion

An in-depth discussion of the important factors of each individual estuarine watershed is included in Appendix H. These discussions highlight the important management indicators within each watershed and discuss the watershed's priority ranking. A more general discussion of the comparison of the five planning regions follows below:

a) The North Shore region exhibited the highest stressor scores with respect to road crossings within tidal regions and amount of tidal restriction. It also exhibited the highest resource score with respect to length of anadromous fish runs (primarily due to fish runs along the Merrimack River). These observations correspond to the qualitative conclusion drawn from Appendix F, which shows the North Shore region with high priority for Management Priority 3.

Additional important resources in the North Shore region were salt marshes, tidal flats, and shellfish habitat, for which this region received the highest scores. The North Shore region had the lowest scores of the five regions for seagrass extent, impervious area, and 303(d) impairments for nutrients.

b) The Salem Sound region received the highest score of any region for road crossings, although many of these road crossings did not fall within a tidal area. This meant that with respect Management Priority 3, Salem sound ranked just behind North Shore in terms of its priority. Salem Sound had the highest density of any region with respect to shorebird nesting sites. Salem Sound was the lowest ranked region with respect to septic system use and wastewater discharge to groundwater, meaning that these stressors are a relatively low management priority in this region. It was also ranked lowest with respect to salt marsh extent and tidal flat extent, meaning these resources were relatively scarce as compared to other regions.

c) The Metro Boston region scored highest of all regions with respect to several inter-related stressors, including high intensity land use, stormwater runoff volume, impervious area, and population. It also scored highest with respect to 303(d) impairments for bacteria. The region was second behind the North Shore with respect to anadromous fish run length, although other resource scores were relatively low.

d) The South Shore region scored highest with respect to wastewater discharge to groundwater, septic system use and 303(d) impairments for nutrients. It also had the highest density of impoundments that lacked a fish passage structure, indicating that this is a priority for the region. Of the five regions, the South Shore had the highest percentage of seagrass with respect to its open water, as well as the highest density of shorebird habitat.

e) Cape Cod received the lowest scores of the five regions on the majority of the stressor categories (indicating a lack of stressors and an overall positive watershed health). However, the region did have the second most prevalent use of septic systems and wastewater discharge to groundwater (second behind the South Shore region), indicating that this is a management priority in this region.

   The region was also ranked second with respect to salt marsh extent, tidal flats, and shellfish habitat, indicating that these are important resources within the region.

The number of high priority estuaries in each region with respect to the stressors vs. resources scoring and the three management priorities are summarize in Table 4.3. These results are for the comparison of all watersheds in the study area rather than the regional analysis (because watersheds were ranked by quartile, 25% of the watersheds would always be ranked high priority in the regional comparative analysis). The table lists each region followed by how many estuarine watersheds are located within that region, and then the number of high priority watersheds for each category of prioritization, followed by the percentage of the total number of estuarine watersheds in the region that were classified as high priority.

Table 4.3 Number of High Priority Watersheds per Planning Region

Region (total no. of watersheds in region)	Stressors vs. Resources Matrix *	Management Priority 1	Management Priority 2	Management Priority 3
North Shore (9)	3 (33%)	1 (11%)	2 (22%)	6 (66%)
Salem Sound (6)	4 (66%)	3 (50%)	0 (0%)	4 (66%)
Metro Boston (8)	7 (88%)	4 (50%)	2 (25%)	2 (25%)
South Shore (10)	5 (50%)	2 (20%)	5 (50%)	4 (40%)
Cape Cod (14)	0 (0%)	0 (0%)	2 (14%)	0 (0%)

* Includes estuarine watersheds ranked "High Priority" and "Moderately High Priority" on the Resource/Stressor Matrix (see figure 4.2)

APPENDIX A

METHOD FOR ESTIMATING ANNUAL STORMWATER RUNOFF VOLUME

Geosyntec consultants

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Memorandum

Date: 04 September 2012

To: Prassede Vella, Massachusetts Bays Program (MBP)

From: Chad Yaindl, Geosyntec Consultants
Robert Hartzel, Geosyntec Consultants

Subject: Estuary Assessment and Delineation
Method for Estimating Annual Stormwater Runoff

Massachusetts Bays Program (MBP) has selected Geosyntec Consultants, Inc. (Geosyntec) to prepare an Estuary Assessment and Delineation that will lay the groundwork for MBP to periodically assess the health of estuarine systems within its planning area. This project is part of MBP's overall process of reviewing and updating its Comprehensive Conservation and Management Plan (CCMP). The focus of the CCMP is 47 estuaries and embayments along the eastern coast of Massachusetts.

As part of the project, Geosyntec collected geospatial data representative of a number of indicators of estuarine ecologic health. In most cases, the data is readily available through public agencies such as MassDEP, USGS, USDA, etc. However, in the case of one important indicator, volume of stormwater runoff, no such data source exists. This memo outlines the method by which Geosyntec estimated stormwater runoff volume using other available data sources.

The general process to estimate stormwater runoff volume consisted of the following:

1. Create polygons that contain the intersected attributes of land use and hydrologic soil group (HSG);
2. Assign a Curve Number to each unique land use/HSG pairing;
3. Using a historic record of rainfall events over the past 50 years for the Boston area, determine the depth of annual runoff in inches for each Curve Number;
4. Assign annual runoff depth to each land use/HSG polygon; and
5. Calculate total annual runoff volume for each estuarine watershed using spatial analysis.

Land use types and polygons were obtained from the MassGIS Land Use 2005 data layer. Hydrologic Soil Group (HSG) was determined using soil survey polygons and a soil properties database available from the USDA NRCS Soil Data Mart. The two polygon layers were

intersected in GIS to create a new polygon shapefile that contained the attributes of the original two datasets.

Curve Numbers are empirically-derived quantities used in the Soil Conservation Service Rainfall-Runoff model to represent the land use and soil type of a given area. Curve Numbers generally range from the mid 30's (for a highly pervious, good condition forested area) to 98 (for a fully impervious, paved surface). Table 1 lists the various combinations of land use and HSG obtained from the intersection of the two data layers, and the Curve Numbers that were assigned to each. Curve Numbers were chosen from a listing of published values presented in *Hydrologic Analysis and Design* (Richard H. McCuen, 2005).

The SCS Rainfall-Runoff method is used to predict the amount of runoff generated by a given storm event. Geosyntec obtained records of individual precipitation events from the National Climatic Data Center precipitation monitoring station at Logan International Airport in Boston. The data lists the precipitation depth for all rainfall events from 1957-2008 (no data for year 1990), for a total of 51 years. Figure 1 shows the precipitation depth associated with the collection of events. The sum of all event depths divided by the number of years on record (51) resulted in an average annual precipitation of 46 inches.

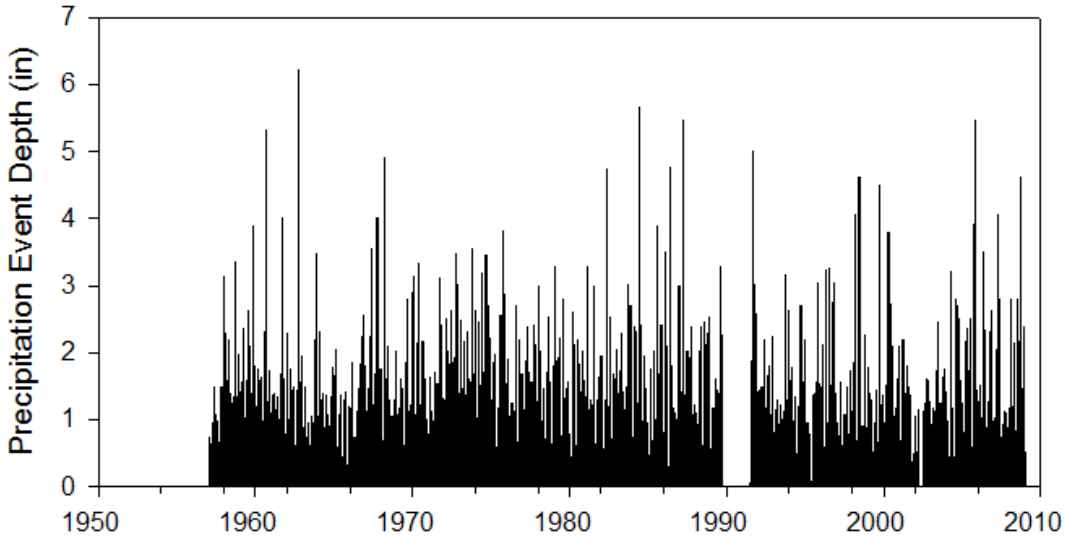

Figure 1. Precipitation Event Depth, Logan International Airport, 1957-2008.

Table 1. Curve Numbers assigned to land use/hydrologic soil group pairs.

Land Use Description	Hydrologic Soil Group						
	A	A/D	B	B/D	C	C/D	D
Brushland/Successional	35	56	56	67	70	74	77
Cemetery	49		69	77	79	82	84
Commercial	89	92	92	94	94	95	95
Cranberry Bog	35	56	56	67	70		77
Cropland	64	75	75	80	82	84	85
Forest	30	54	55	66	70	74	77
Forested Wetland	35	56	56	67	70	74	77
Golf Course	39	60	61	71	74	77	80
High Density Residential	77	85	85	87	90	91	92
Industrial	81	87	88	91	91	92	93
Junkyard	81	87	88		91	92	93
Low Density Residential	46	64	65	74	77	80	82
Marina	89	92	92		94	95	95
Medium Density Residential	51	68	68	76	79	82	84
Mining	81	87	88		91	91	92
Multi-Family Residential	77	85	85	87	90	91	92
Non-Forested Wetland	35	56	56	67	70	74	77
Nursery	89	92	92		94	95	95
Open Land	49	67	69	77	79	82	84
Orchard	72		81	86	88	89	91
Participation Recreation	89	92	92	94	94	95	95
Pasture	49	67	69	77	79	82	84
Powerline/Utility	49	67	69	77	79	82	84
Saltwater Wetland	35	56	56	67	70	74	77
Spectator Recreation	89	92	92		94	95	95
Transitional	49	67	69	77	79	82	84
Transportation	98	98	98	98	98	98	98
Urban Public/Institutional	89	92	92	94	94	95	95
Very Low Density Residential	46	64	65	74	77	80	82
Waste Disposal	49	67	69	77	79	82	84
Water-Based Recreation	89	92	92	94	94	95	95

For each event, i, runoff depth was calculated assuming a given curve number, j, using the SCS rainfall-runoff formula:

$$Q_{i,j} = \frac{(P_i - 0.2S_j)^2}{P_i + 0.8S_j}$$

where $Q_{i,j}$ is the runoff depth in inches for event i and curve number j, P_i is the precipitation depth in inches for event i, and

$$S_j = \frac{1000}{CN_j} - 10$$

where CN_j is the curve number.

Annual runoff depth for a given curve number was calculated by adding together all the individual event runoff depths for that curve number and dividing by the number of years on record. Each annual runoff depth was then compared to the annual precipitation depth as shown in Figure 2, resulting in a ratio of annual runoff to annual precipitation, Q/P.

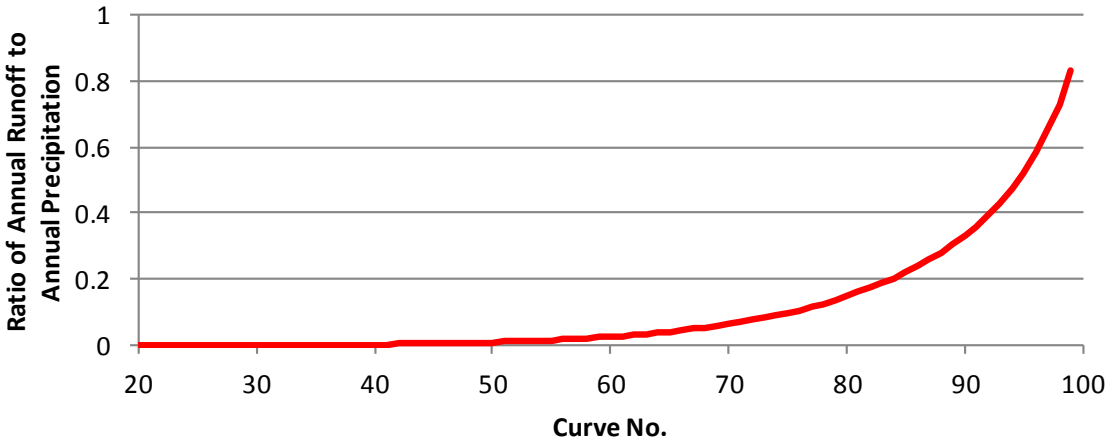

Figure 2. Ratio of Annual Runoff to Annual Precipitation for a range of Curve Numbers.

Values of the ratio Q/P were then assigned to each land use/HSG polygon according to the Curve Number associated with each polygon. These polygons were converted to a raster whose value was the Q/P ratio. Annual Precipitation for Massachusetts was determined using a dataset from USDA, shown below in Figure 3. This dataset was also rasterized. The multiplication of the Q/P raster and the Annual Precipitation raster created a resulting raster whose value was annual

runoff depth in inches (Figure 4). Spatial analysis was used to calculate the zonal mean value of the annual runoff depth raster for each watershed. Multiplying the average runoff depth of a watershed by its area resulted in an estimate of the total annual stormwater runoff volume for the watershed.

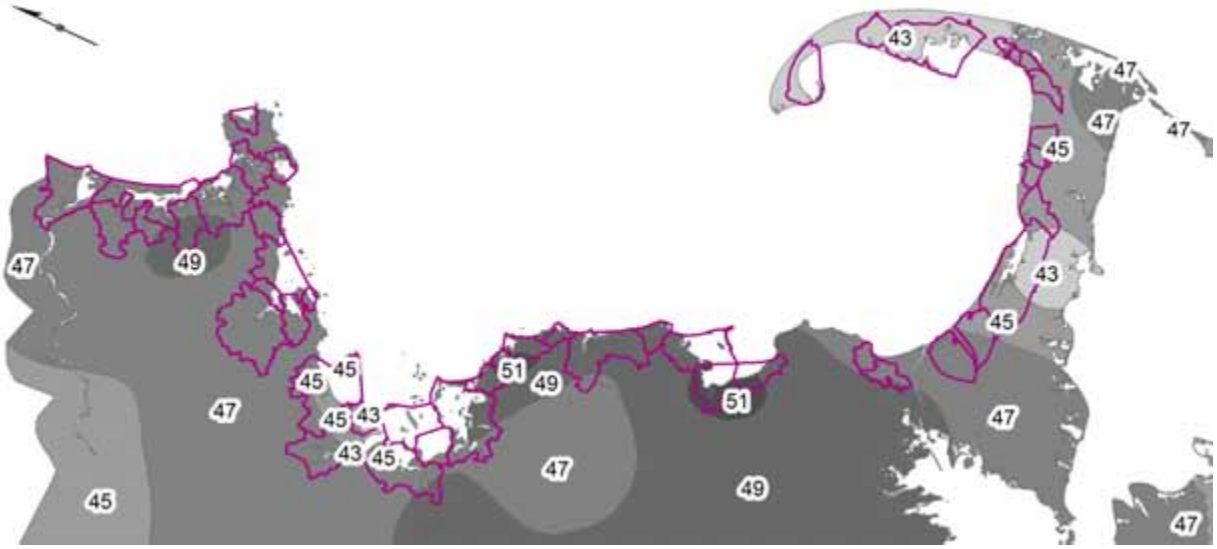

Figure 3. USDA Annual Precipitation, inches (http://datagateway.nrcs.usda.gov/)

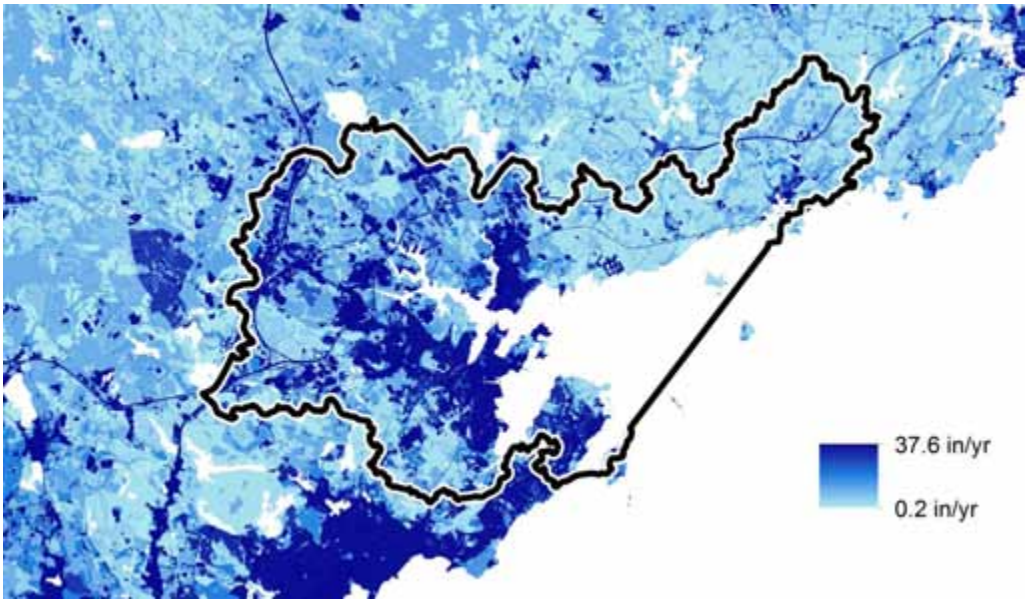

Figure 4. Example of annual stormwater runoff raster, Salem Sound.

Annual runoff depths for the 47 estuarine watersheds ranged from 0.8 inches per year (Pamet River/Little Pamet River) to 14.5 inches per year (Chelsea Creek/Mystic River/Charles River). As a comparison, USGS provides maps of mean annual runoff for the northeastern United States (Randall, 1996). The 'runoff' estimates displayed on these maps include both stormwater runoff and groundwater infiltration (i.e., any water that is not lost through evapotranspiration). The general value for eastern Massachusetts is 22-26 inches. In other words, in the Chelsea Creek/Mystic River/Charles river estuarine watershed, approximately 45 inches of precipitation occurs per year. Approximately half of that is lost to evapotranspiration, and of the remaining 22 inches, 14.5 inches is direct stormwater runoff and 7.5 inches infiltrates and enters the groundwater. Comparison of the annual stormwater runoff estimates to the USGS mean annual runoff estimates provides a good qualitative check on the results, in that none of the estimates of stormwater runoff exceed the USGS estimate of mean annual runoff.

APPENDIX B

MAPS, WATERSHED DELINEATION

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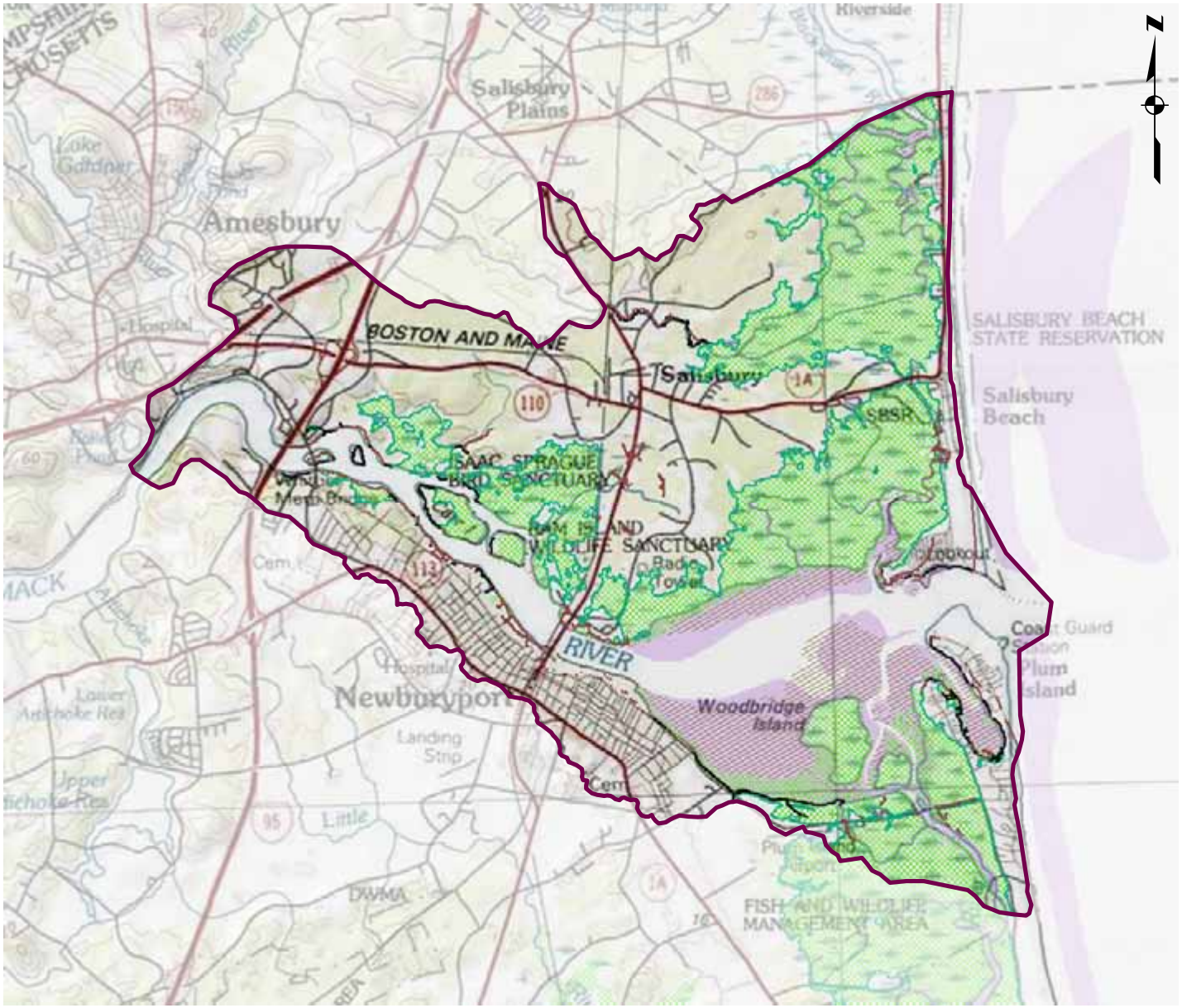

Legend

- Estuarine Watershed Boundary

Landward Boundary Considerations

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- Contemporary High Water
- Marsh Boundary - landward
- Salt Water Wetland

Seaward Boundary Considerations

- Tidal Flats
- Seagrass bed (historic and current)
- Shellfish Suitability (multiple species)

Notes:
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MERRIMACK RIVER / BLACK ROCK CREEK ESTUARINE WATERSHED

Map 1 of 47

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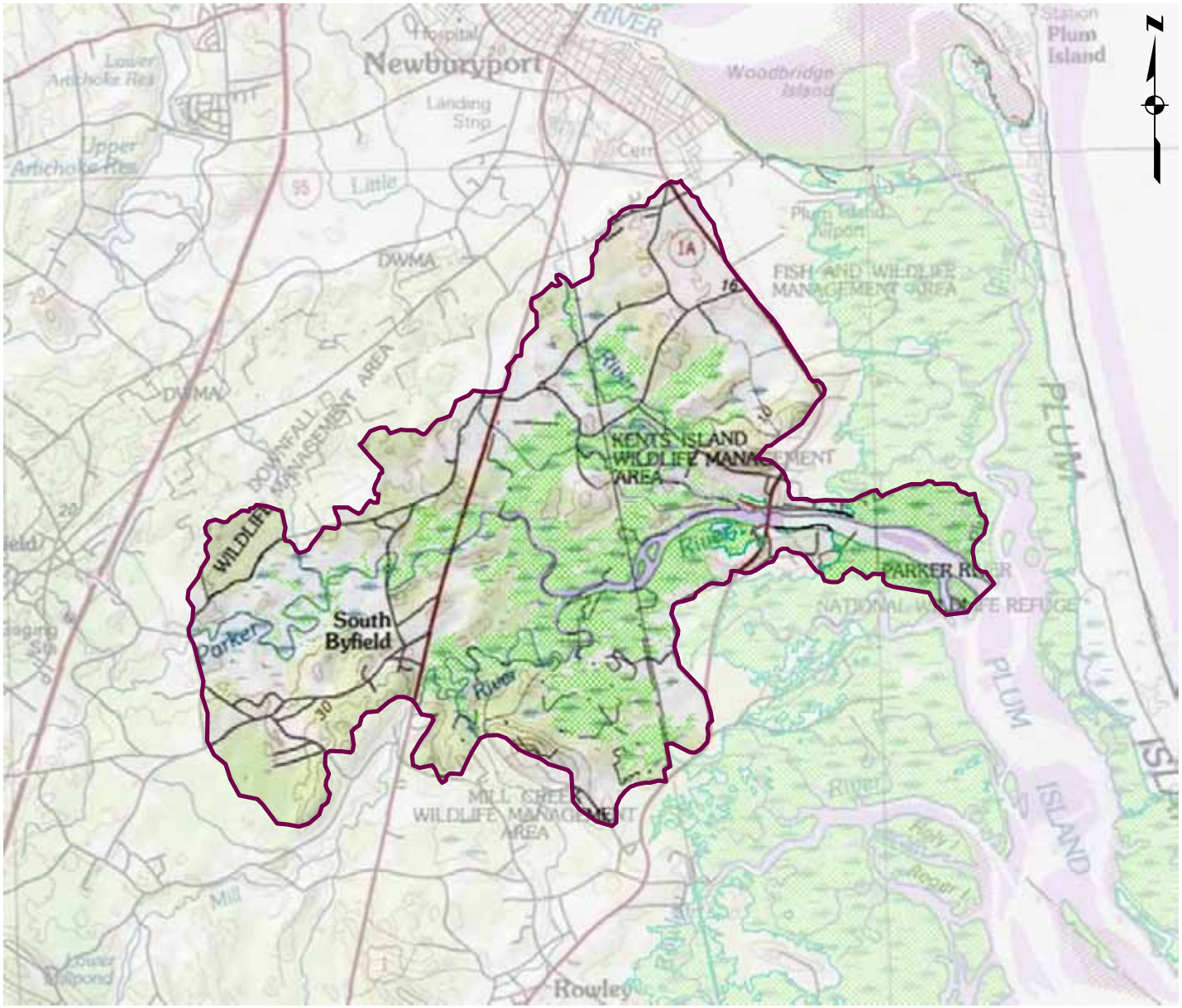

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PARKER RIVER ESTUARINE WATERSHED

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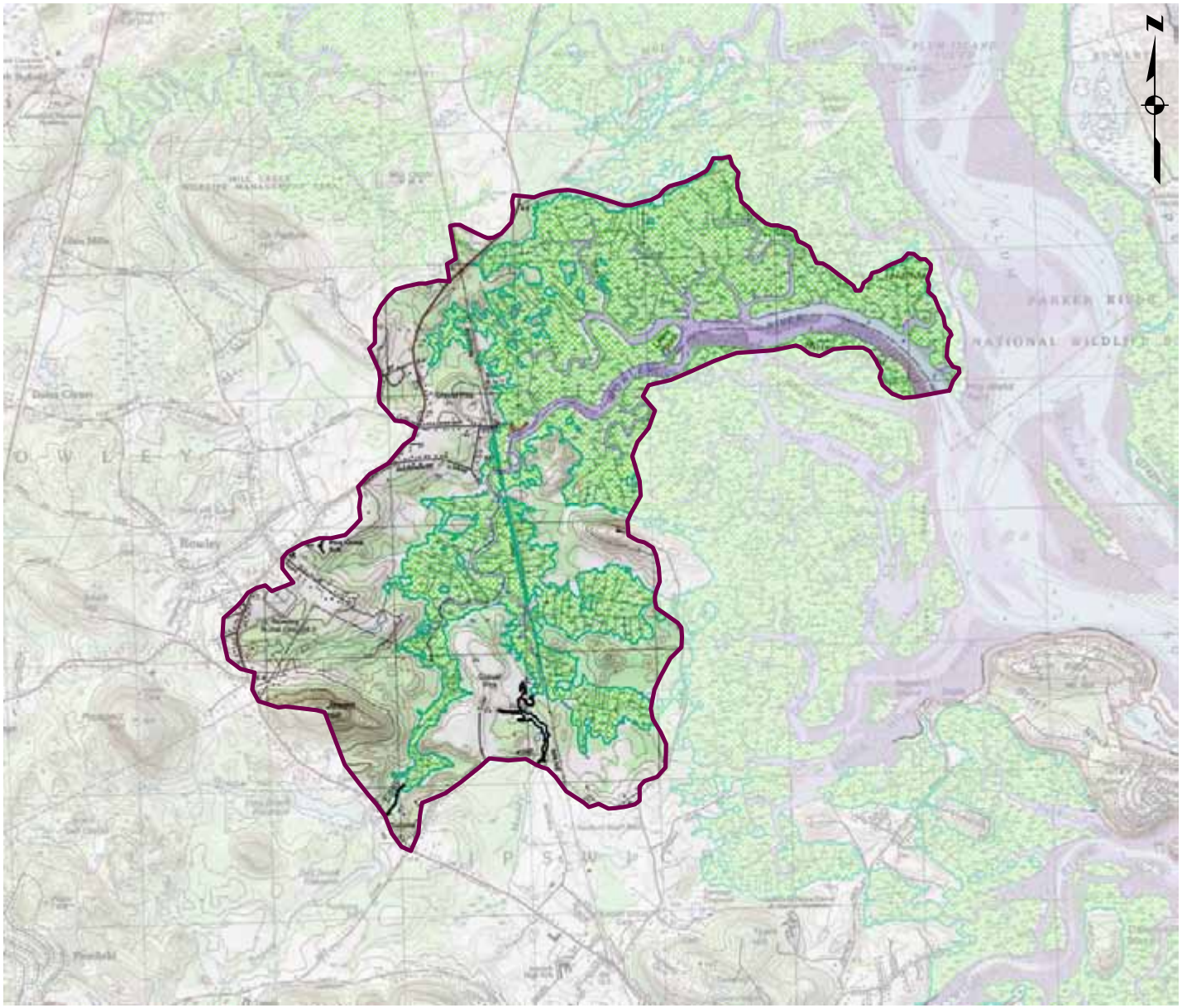

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ROWLEY RIVER ESTUARINE WATERSHED

Map 3 of 47

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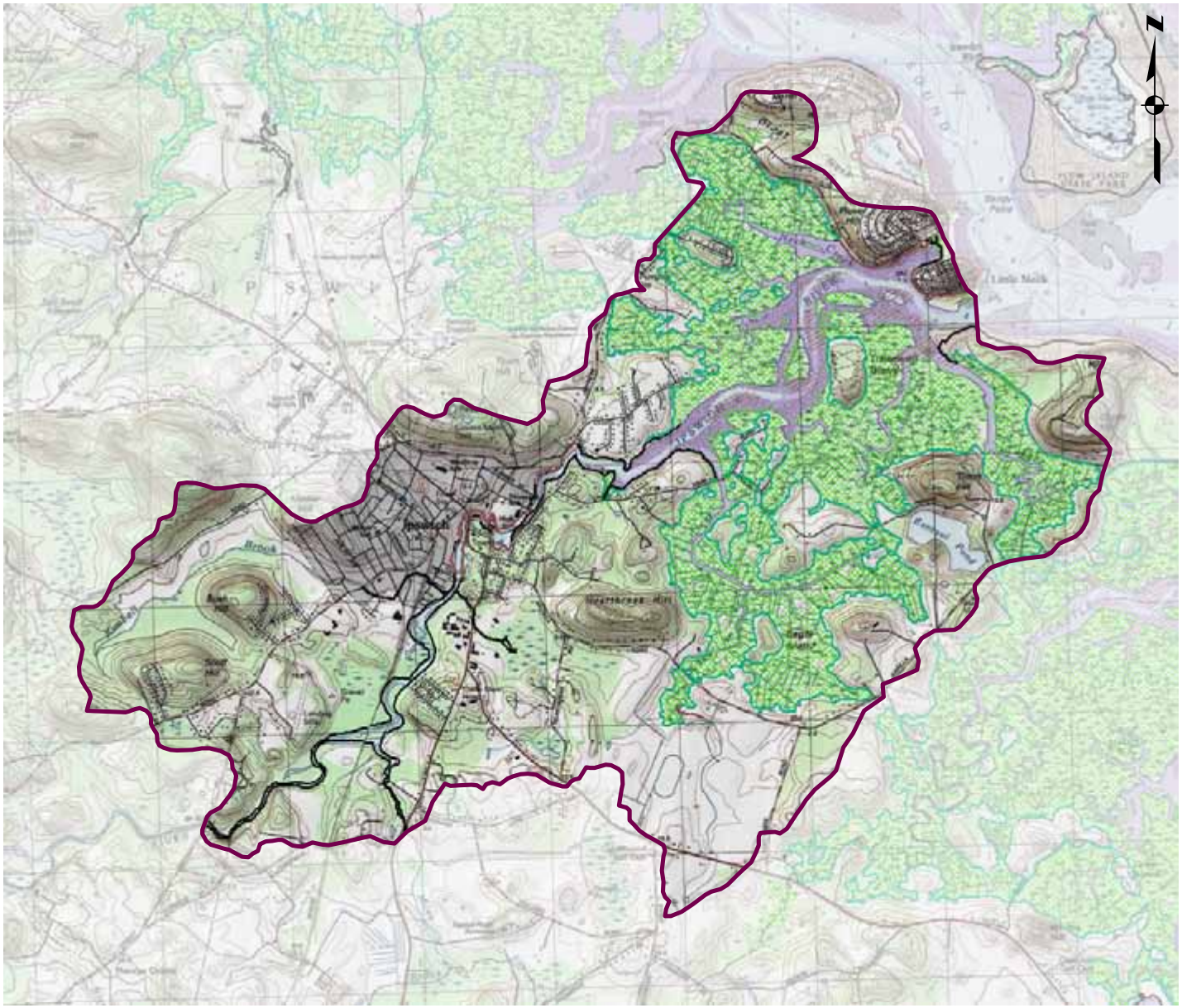

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IPSWICH RIVER ESTUARINE WATERSHED

Map 4 of 47

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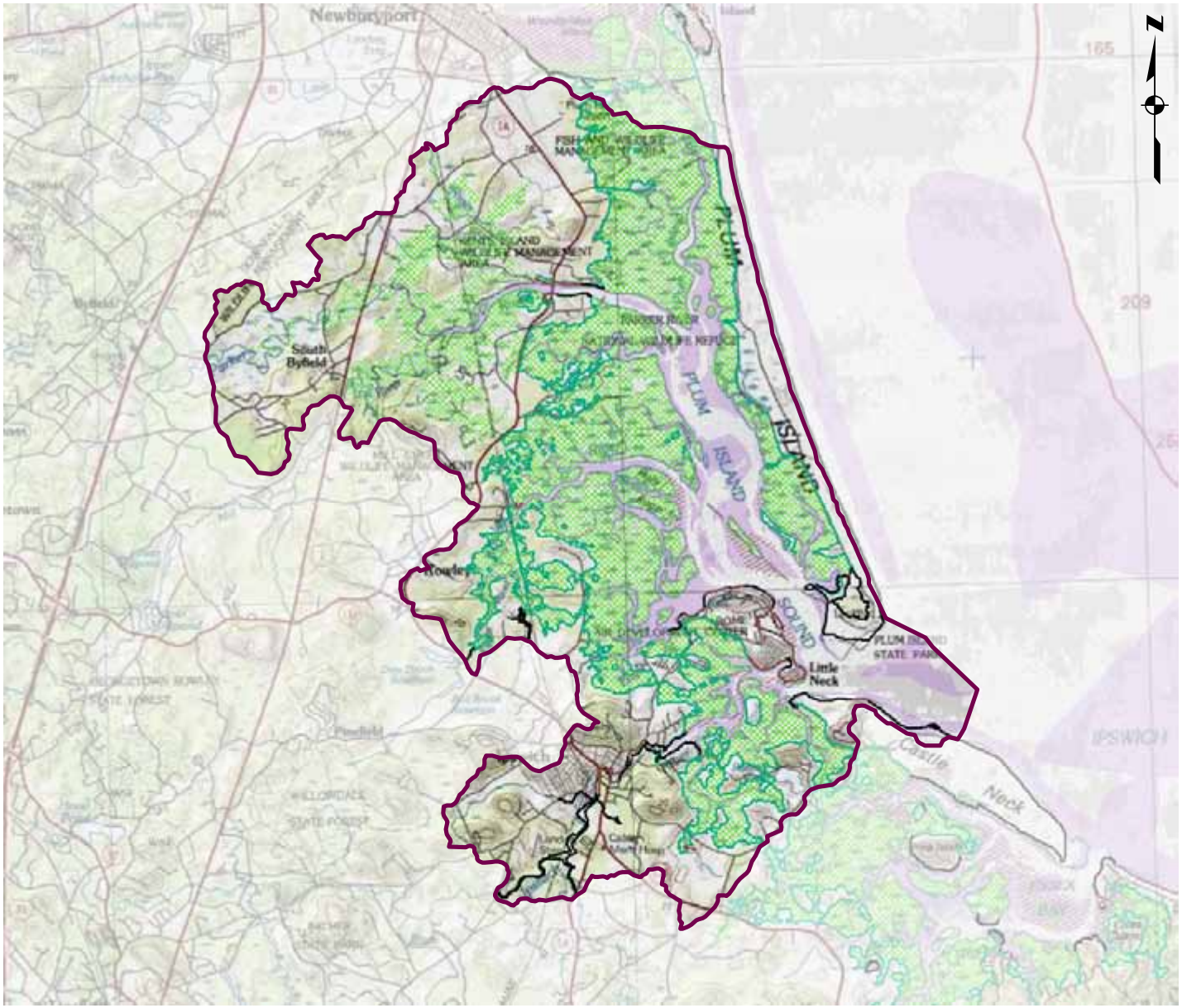

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PLUM ISLAND SOUND ESTUARINE WATERSHED

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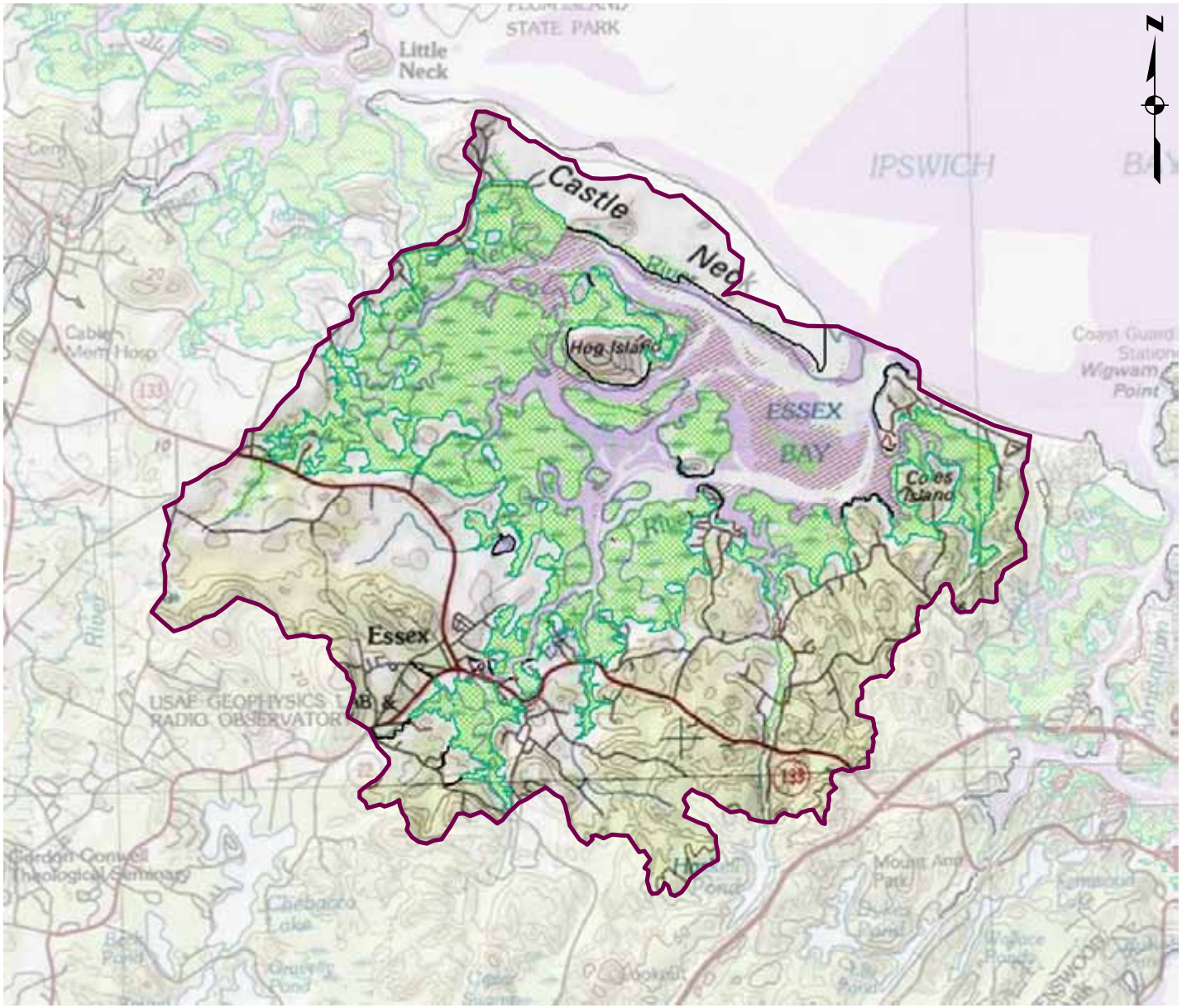

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ESSEX RIVER / ESSEX BAY ESTUARINE WATERSHED

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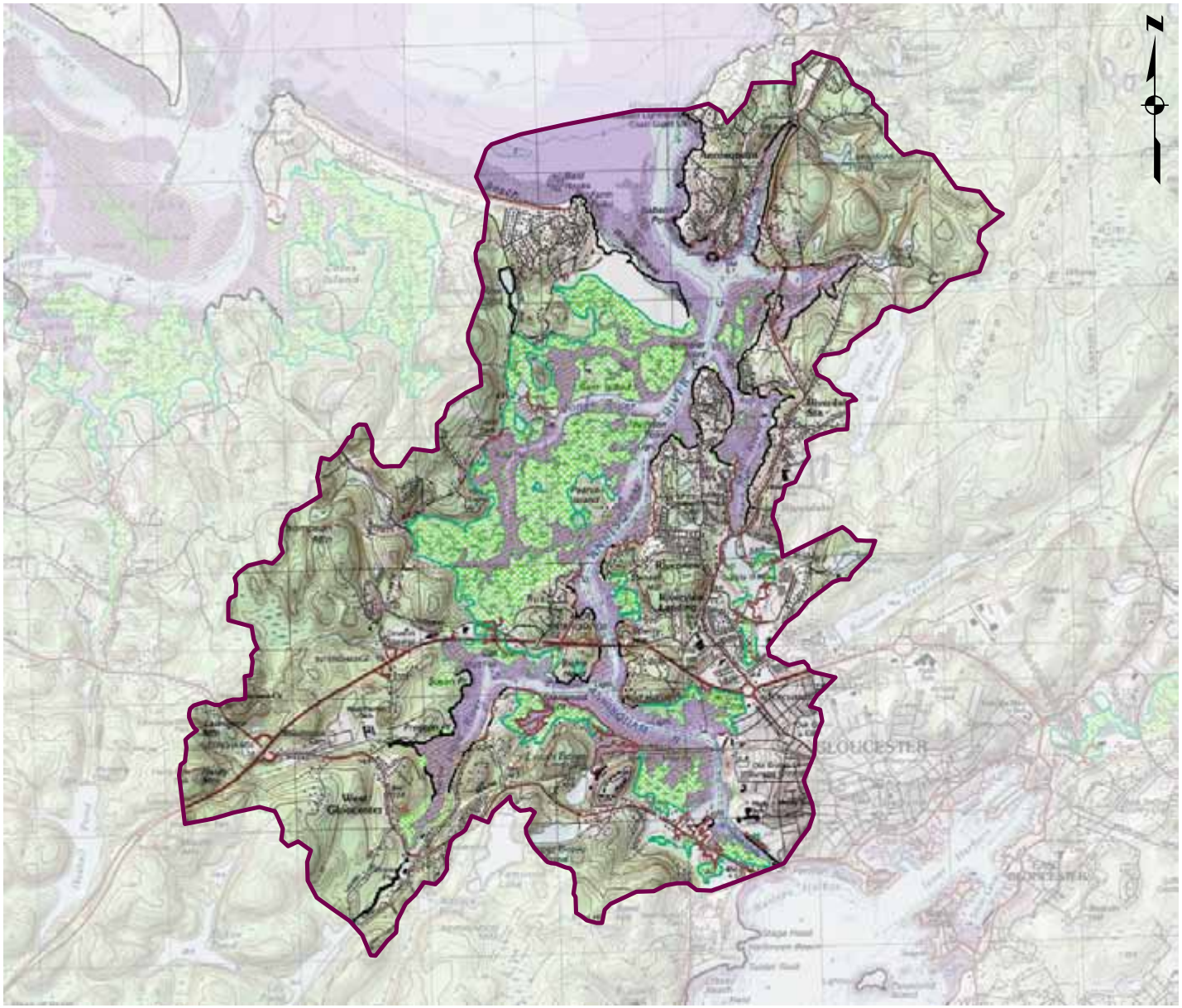

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ANNISQUAM RIVER ESTUARINE WATERSHED

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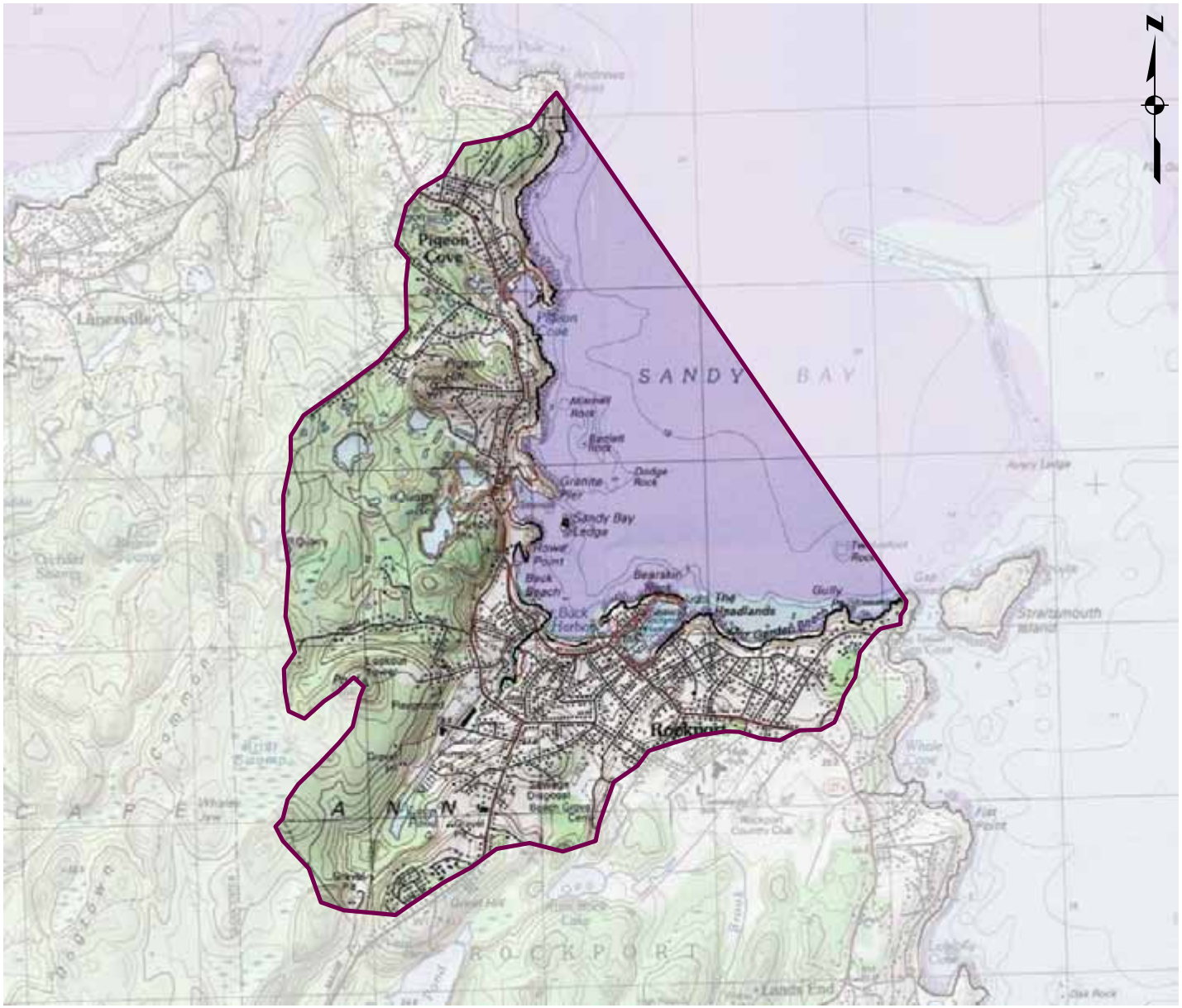

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ROCKPORT HARBOR (SANDY BAY) ESTUARINE WATERSHED

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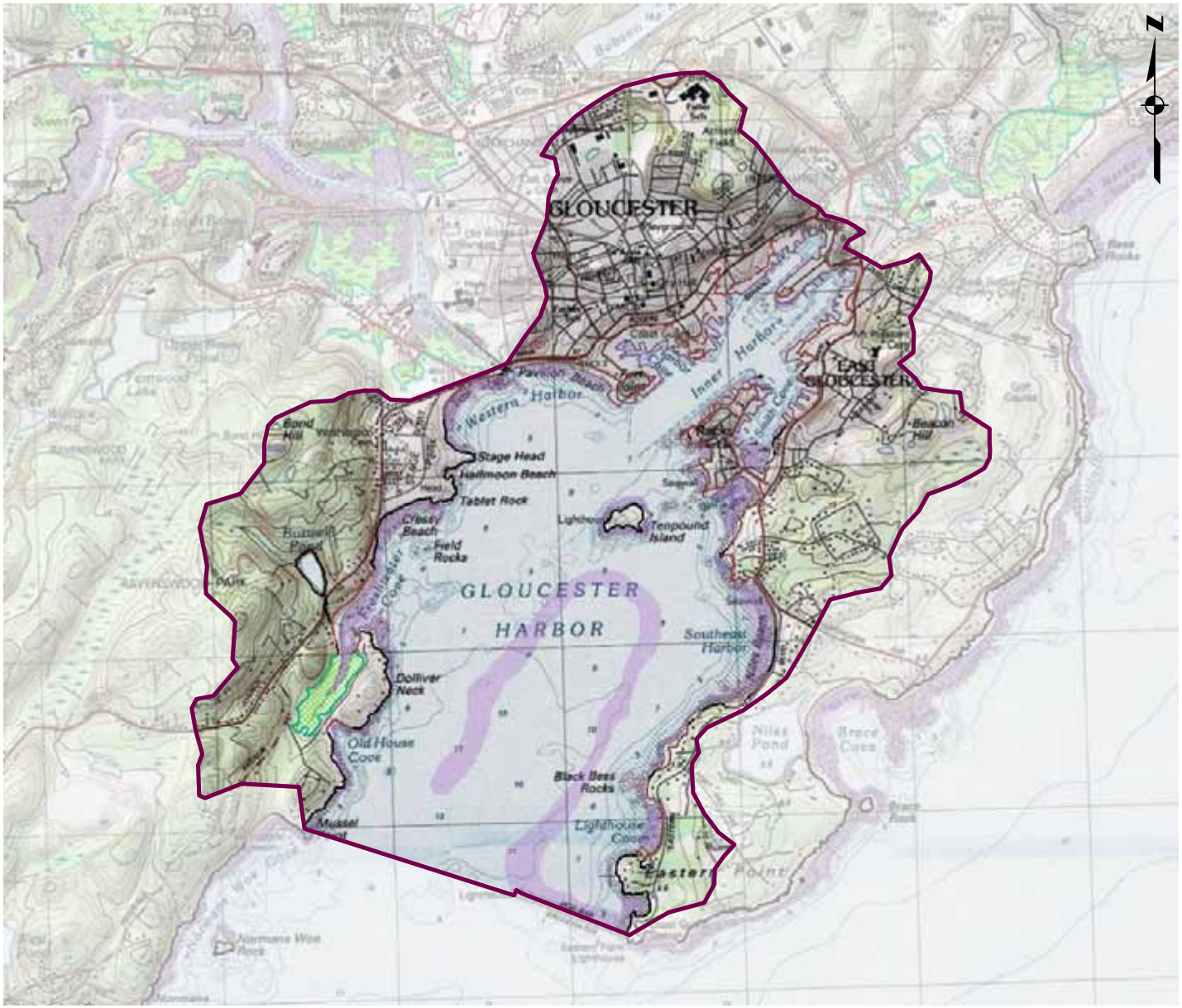

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Massachusetts Bays Program
Estuary Assessment and Delineation
9/6/2012

GLOUCESTER HARBOR ESTUARINE WATERSHED

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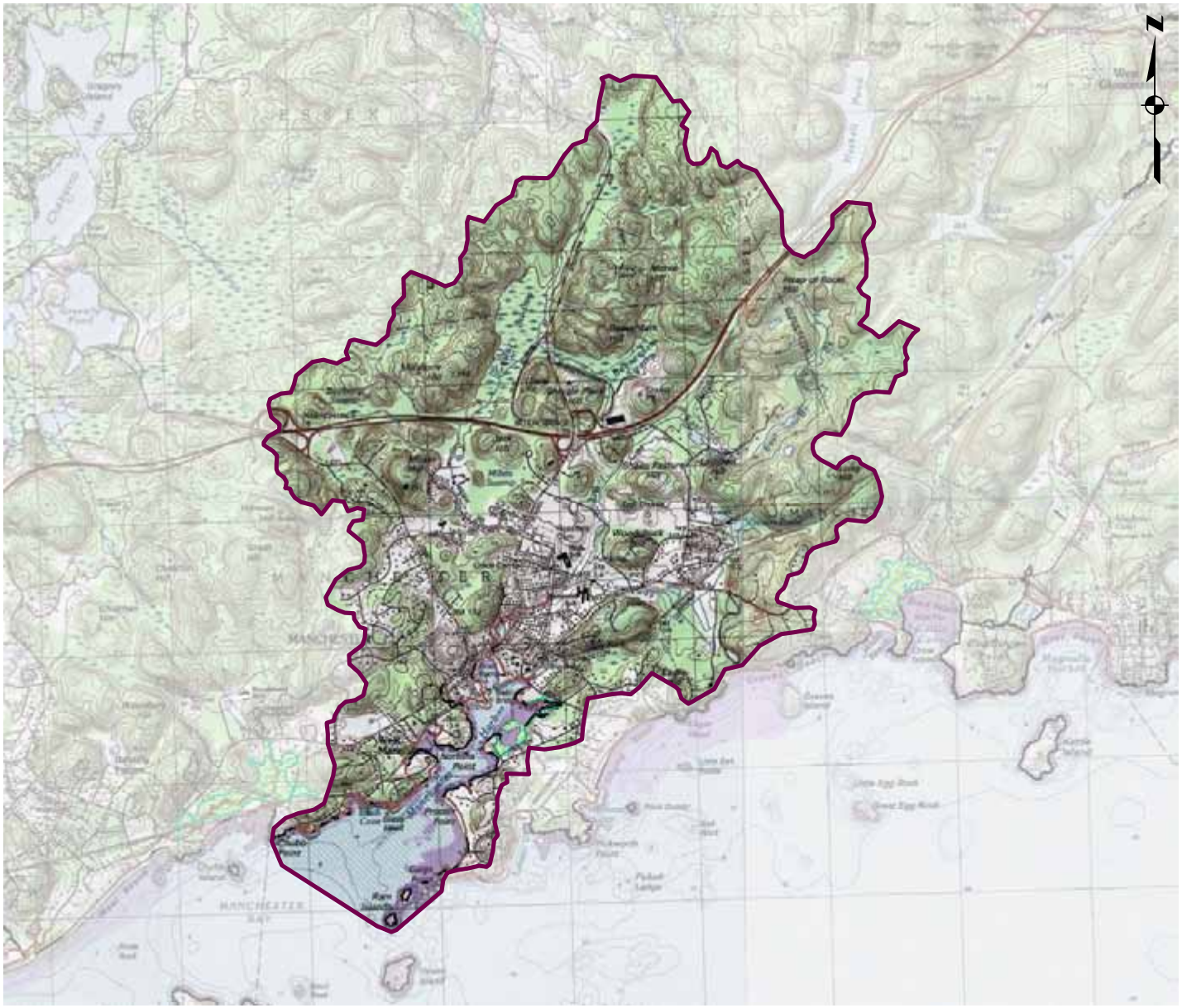

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MANCHESTER HARBOR ESTUARINE WATERSHED

Map 10 of 47

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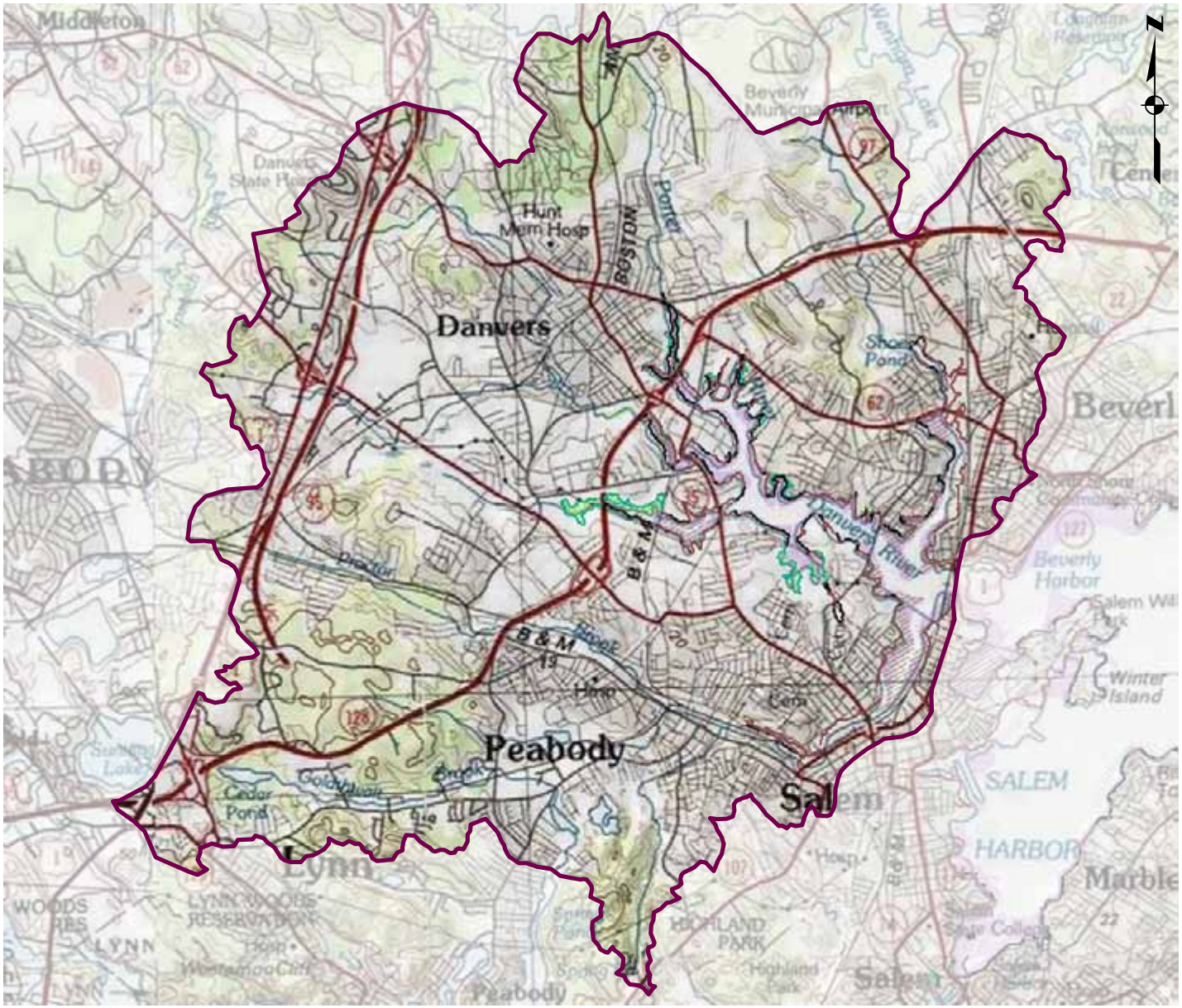

Legend

- Estuarine Watershed Boundary

Landward Boundary Considerations

- Chapter 91 Jurisdiction
- Contemporary High Water
- Marsh Boundary - landward
- Salt Water Wetland

Seaward Boundary Considerations

- Tidal Flats
- Seagrass bed (historic and current)
- Shellfish Suitability (multiple species)

Notes:
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DANVERS RIVER ESTUARINE WATERSHED

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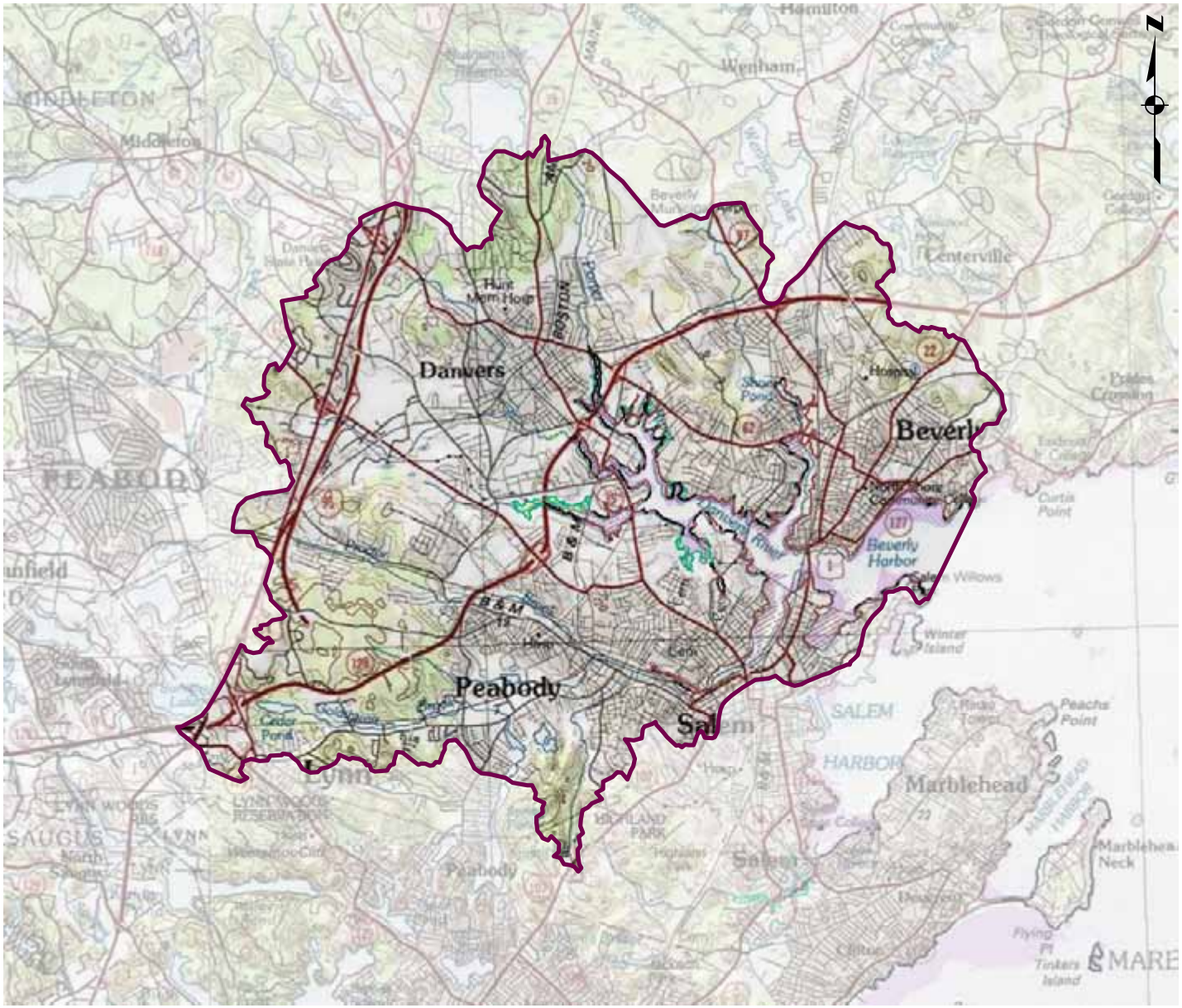

Legend

- Estuarine Watershed Boundary

Landward Boundary Considerations

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- Contemporary High Water
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- Salt Water Wetland

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BEVERLY HARBOR ESTUARINE WATERSHED

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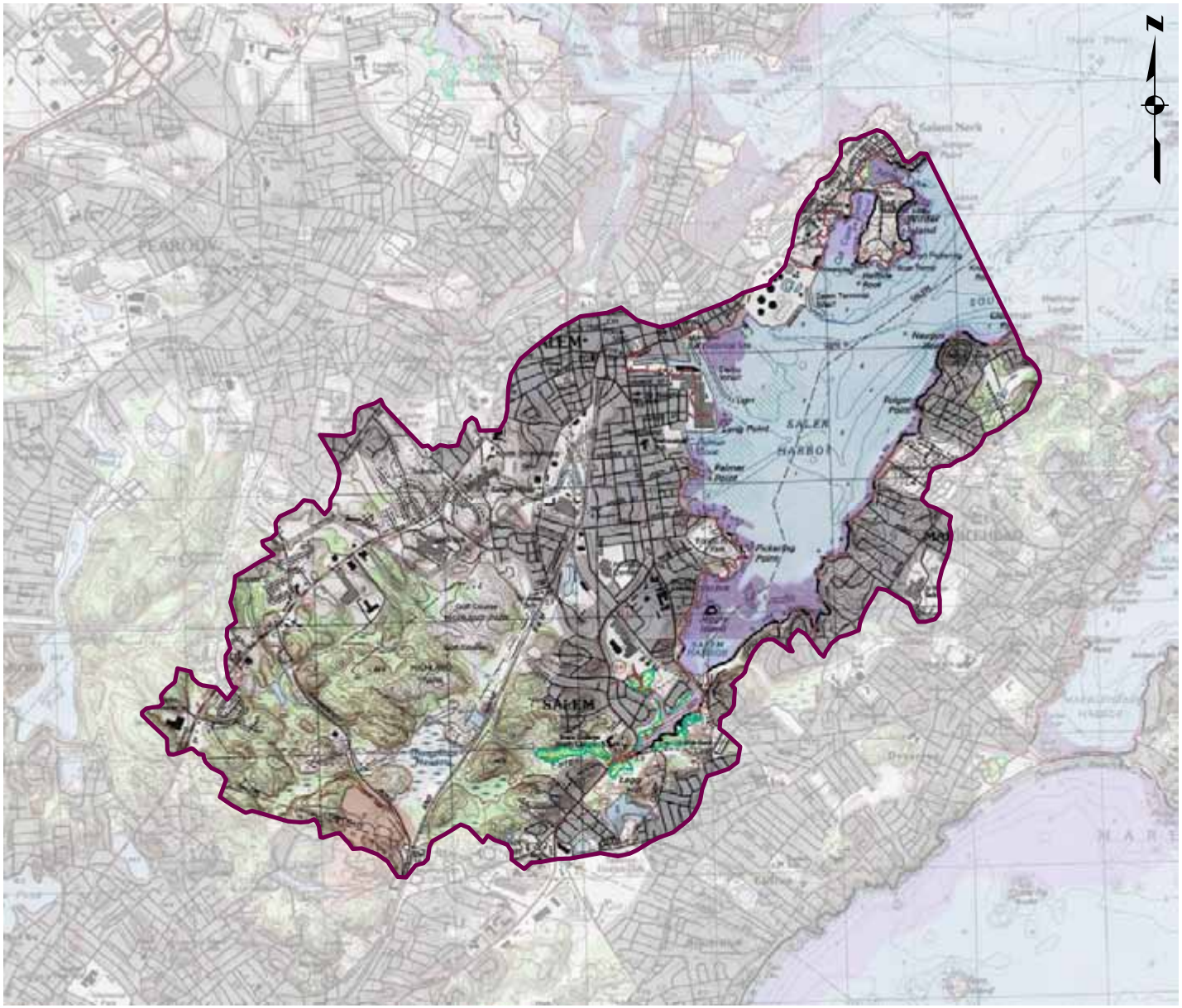

Legend

- Estuarine Watershed Boundary

Landward Boundary Considerations

- Chapter 91 Jurisdiction
- Contemporary High Water
- Marsh Boundary - landward
- Salt Water Wetland

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FOREST RIVER / SALEM HARBOR ESTUARINE WATERSHED

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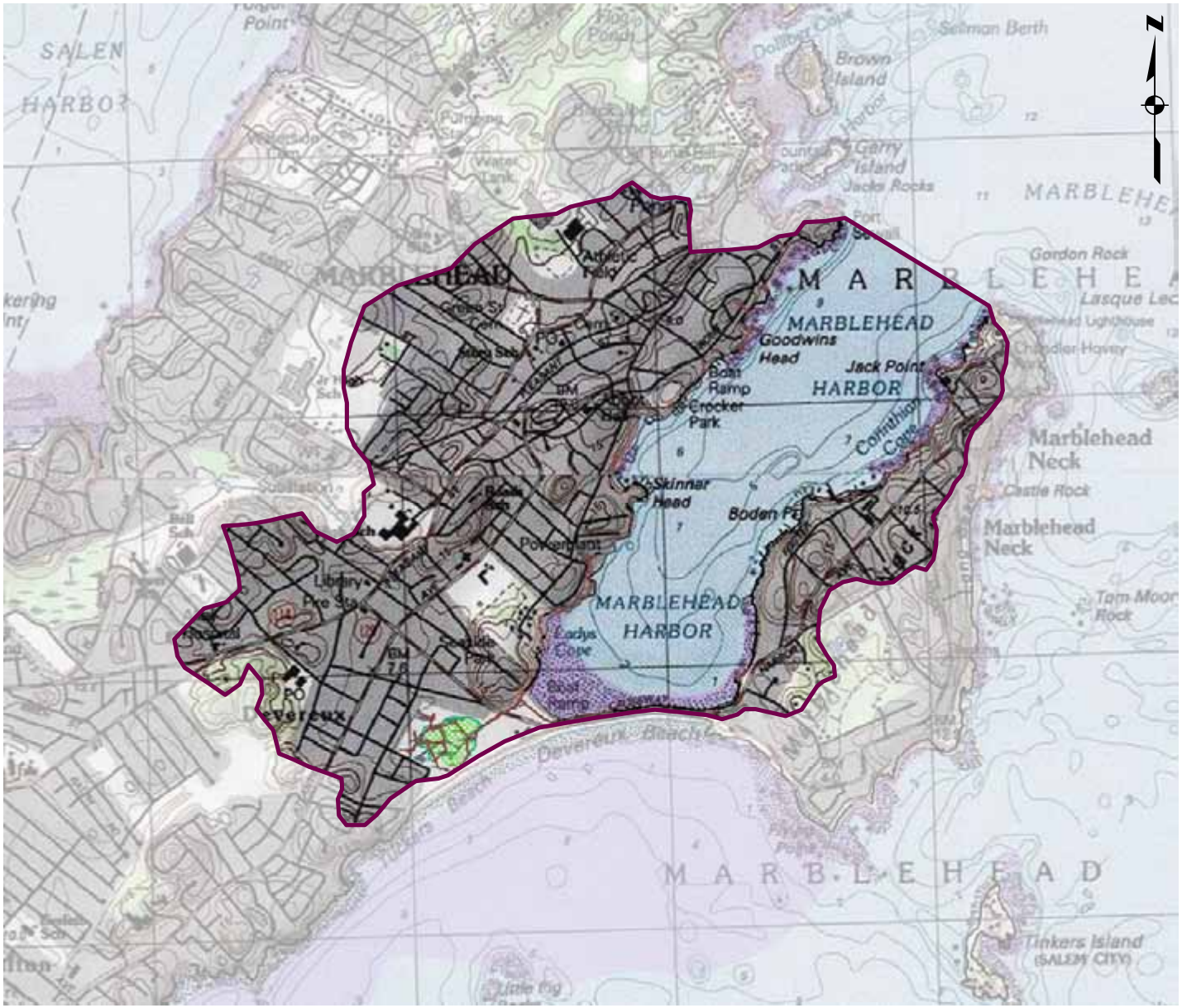

Legend

- Estuarine Watershed Boundary

Landward Boundary Considerations

- Chapter 91 Jurisdiction
- Contemporary High Water
- Marsh Boundary - landward
- Salt Water Wetland

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MARBLEHEAD HARBOR ESTUARINE WATERSHED

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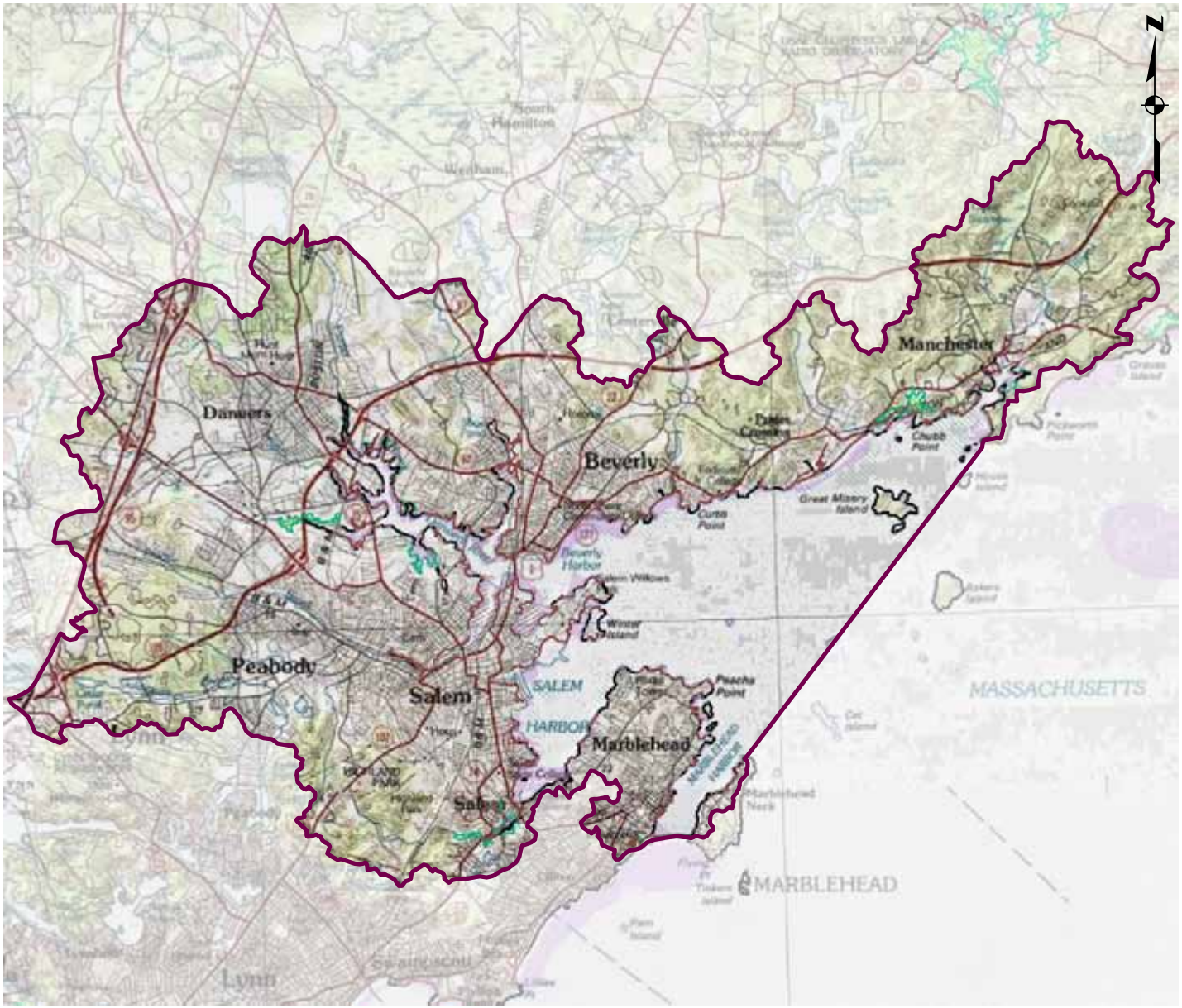

Legend

- Estuarine Watershed Boundary

Landward Boundary Considerations

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- Contemporary High Water
- Marsh Boundary - landward
- Salt Water Wetland

Seaward Boundary Considerations

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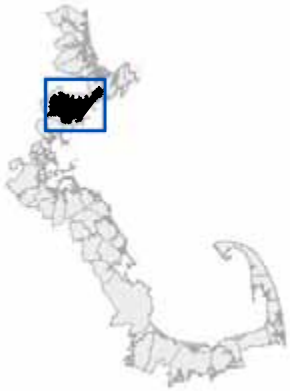

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SALEM SOUND ESTUARINE WATERSHED

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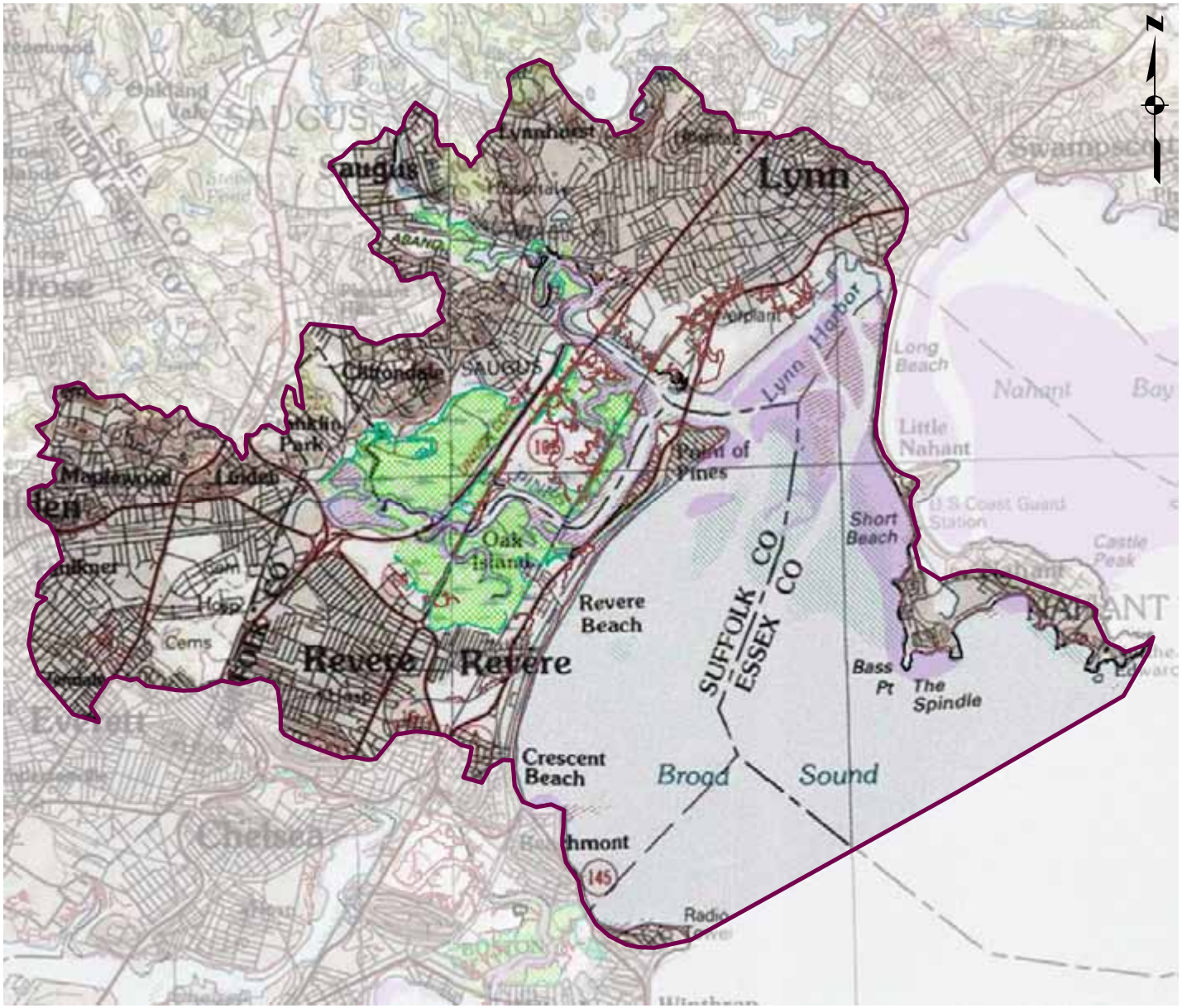

Legend

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Landward Boundary Considerations

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SAUGUS RIVER / PINES RIVER / LYNN HARBOR ESTUARINE WATERSHED

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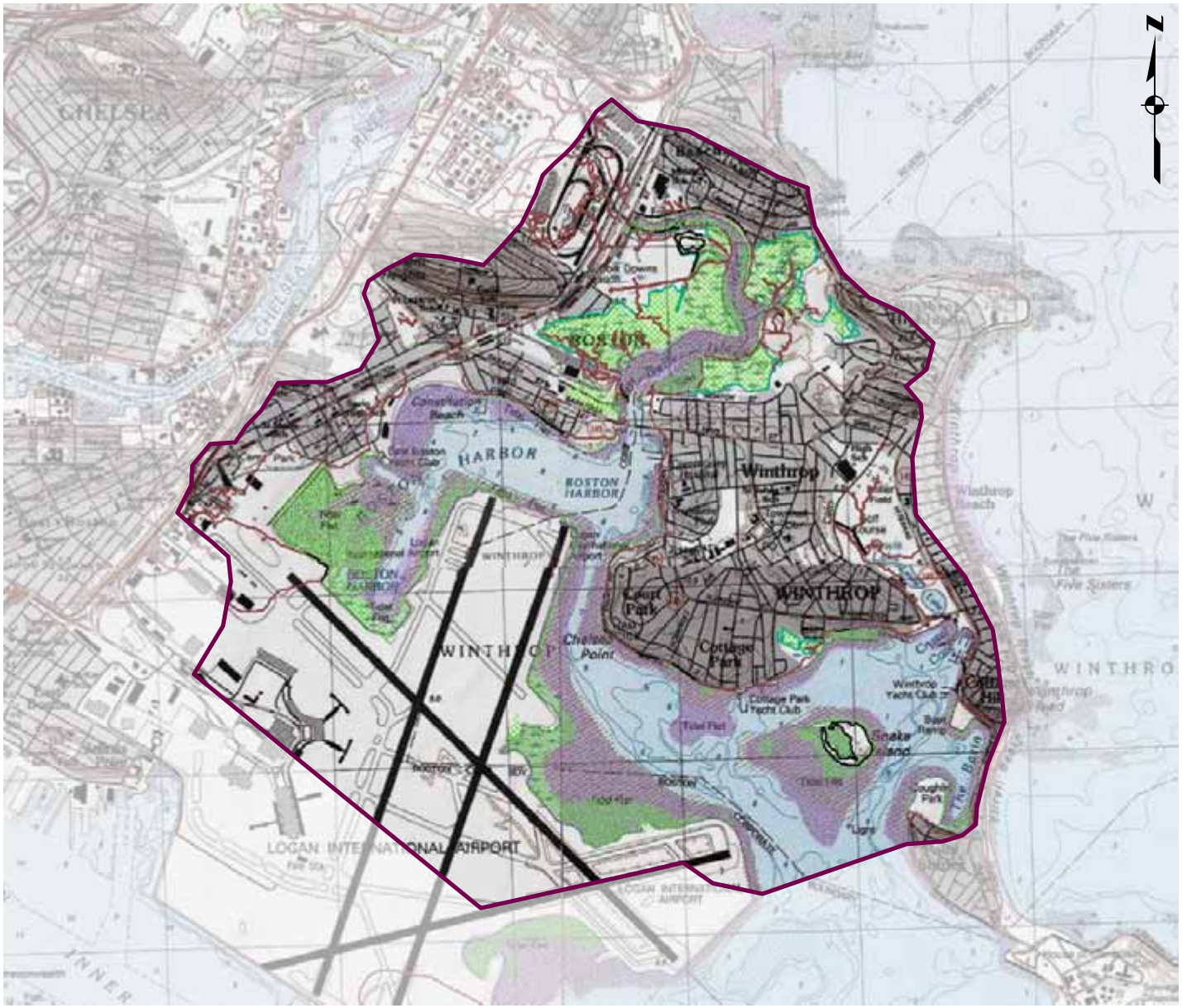

Legend

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BELLE ISLE CREEK / WINTHROP BAY ESTUARINE WATERSHED

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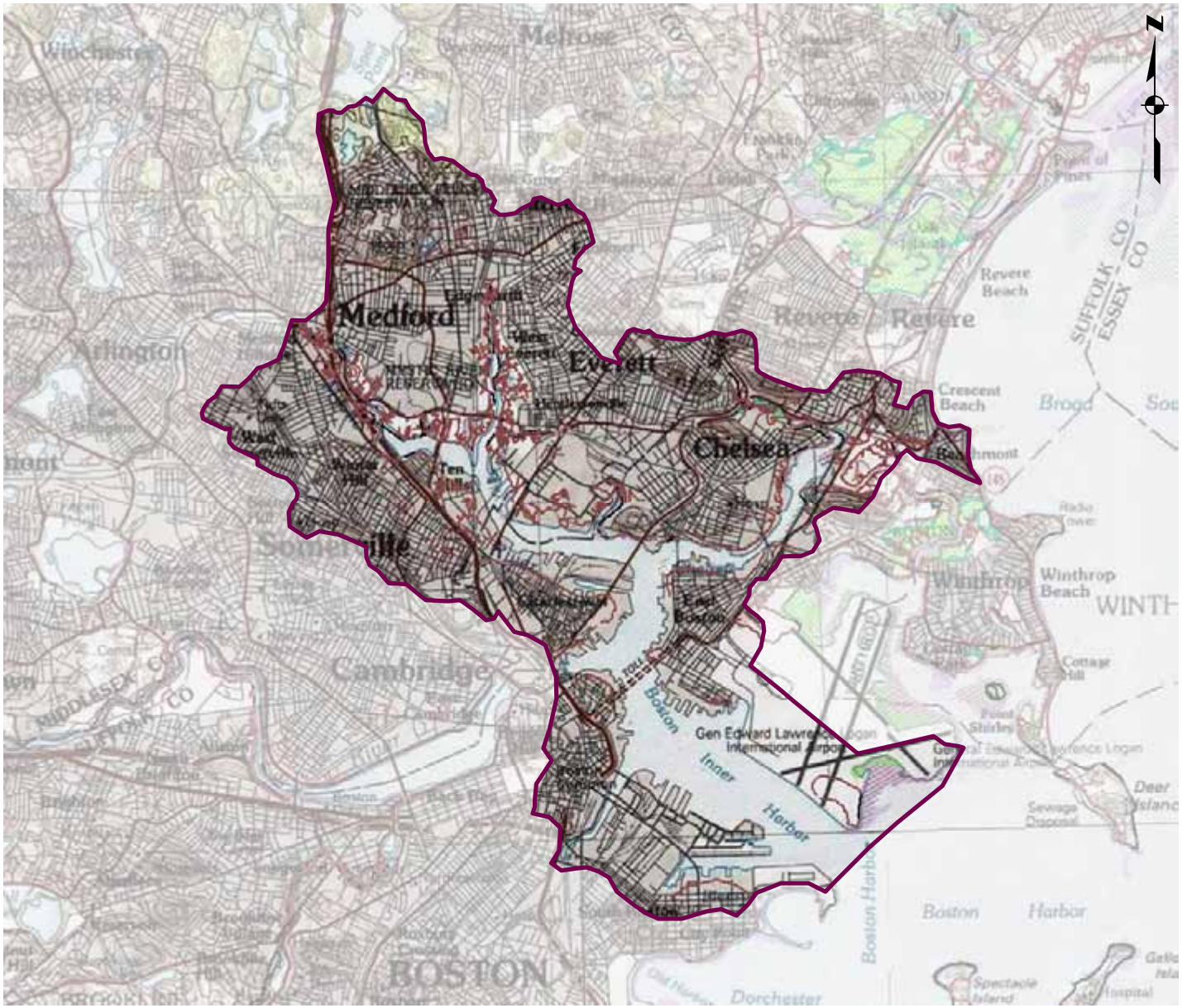

Legend

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Landward Boundary Considerations

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CHELSEA CREEK / MYSTIC RIVER / CHARLES RIVER ESTUARINE WATERSHED

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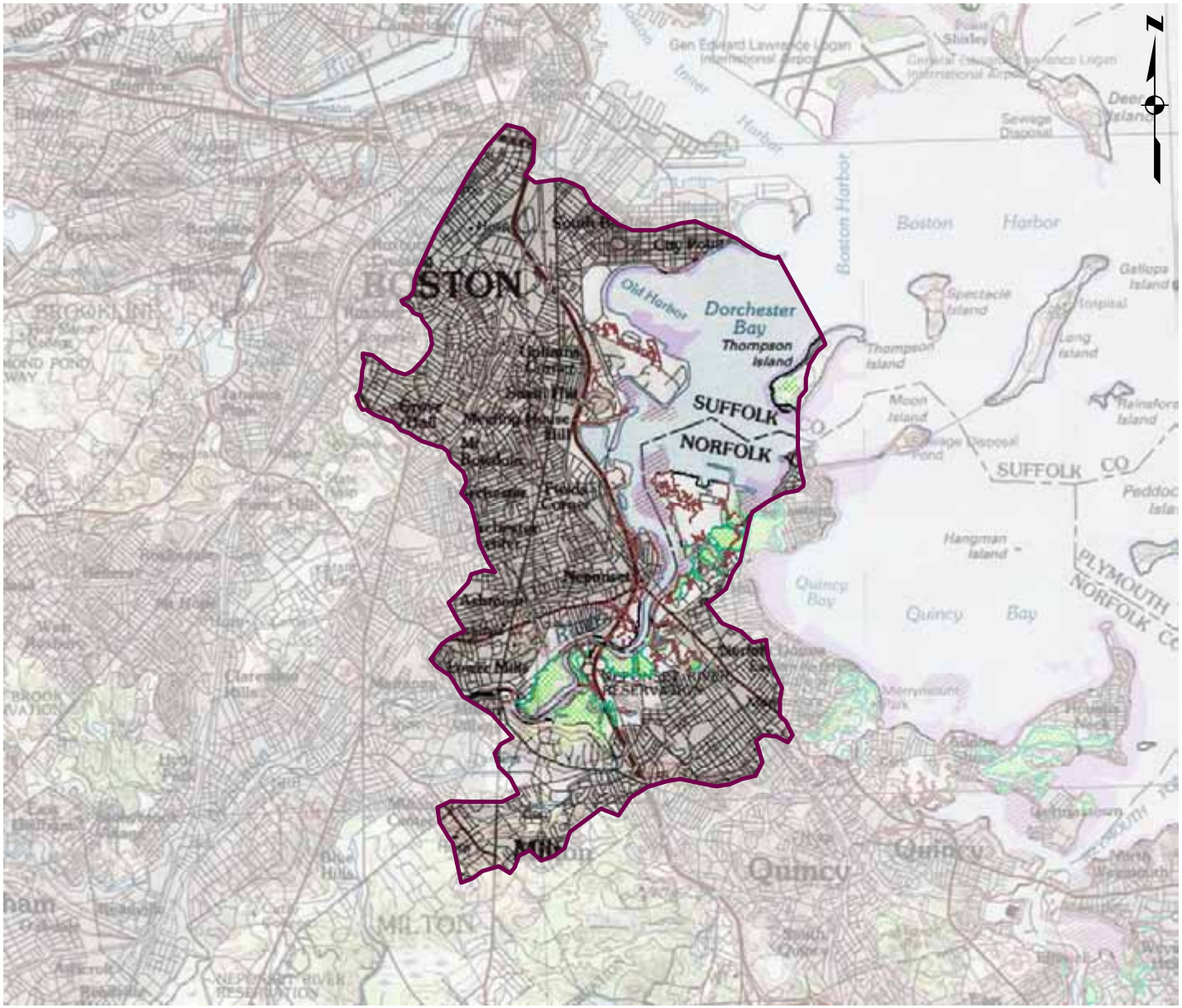

Legend

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Landward Boundary Considerations

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NEPONSET RIVER / DORCHESTER BAY ESTUARINE WATERSHED

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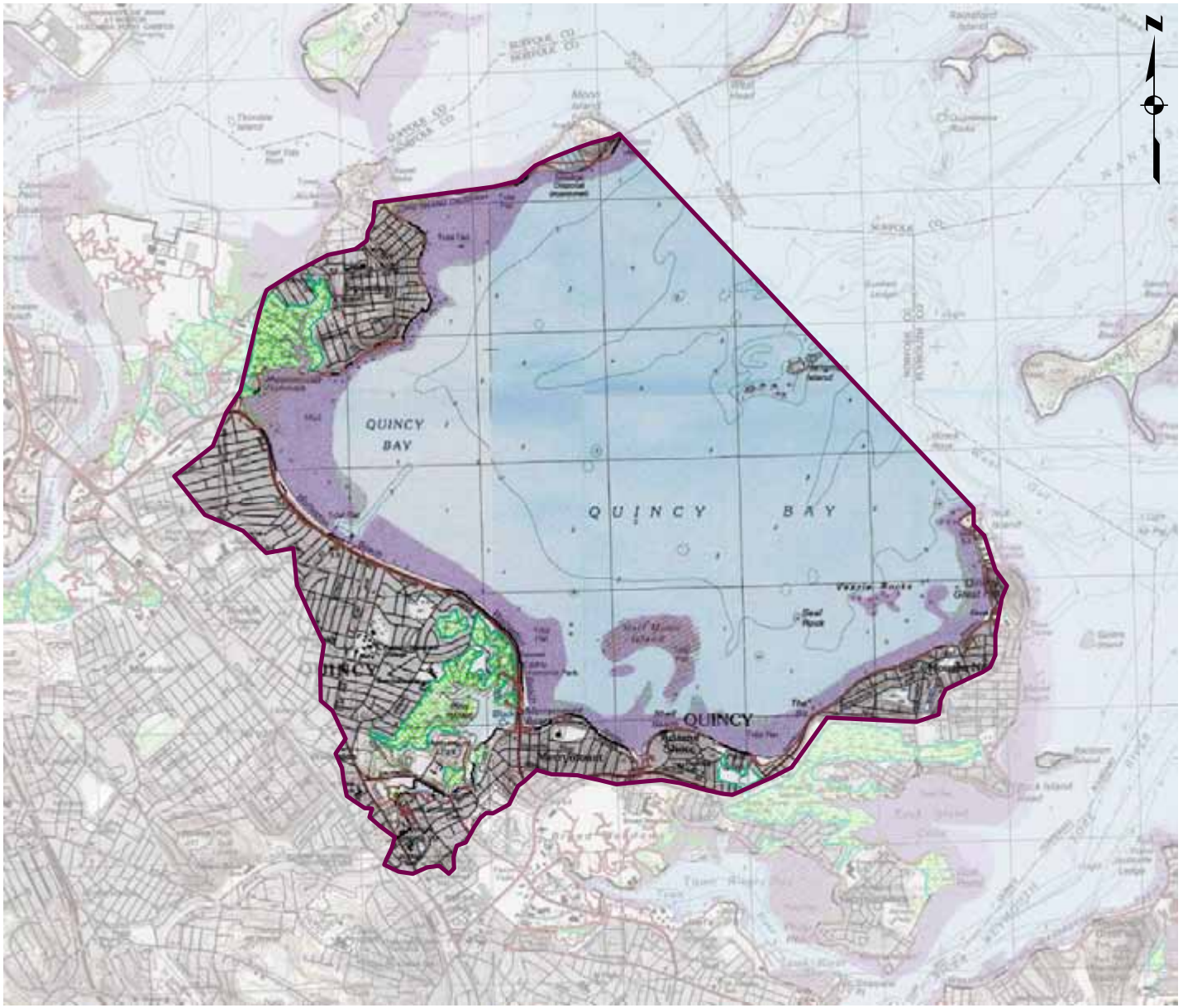

Legend

- Estuarine Watershed Boundary

Landward Boundary Considerations

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BLACKS CREEK / QUINCY BAY ESTUARINE WATERSHED

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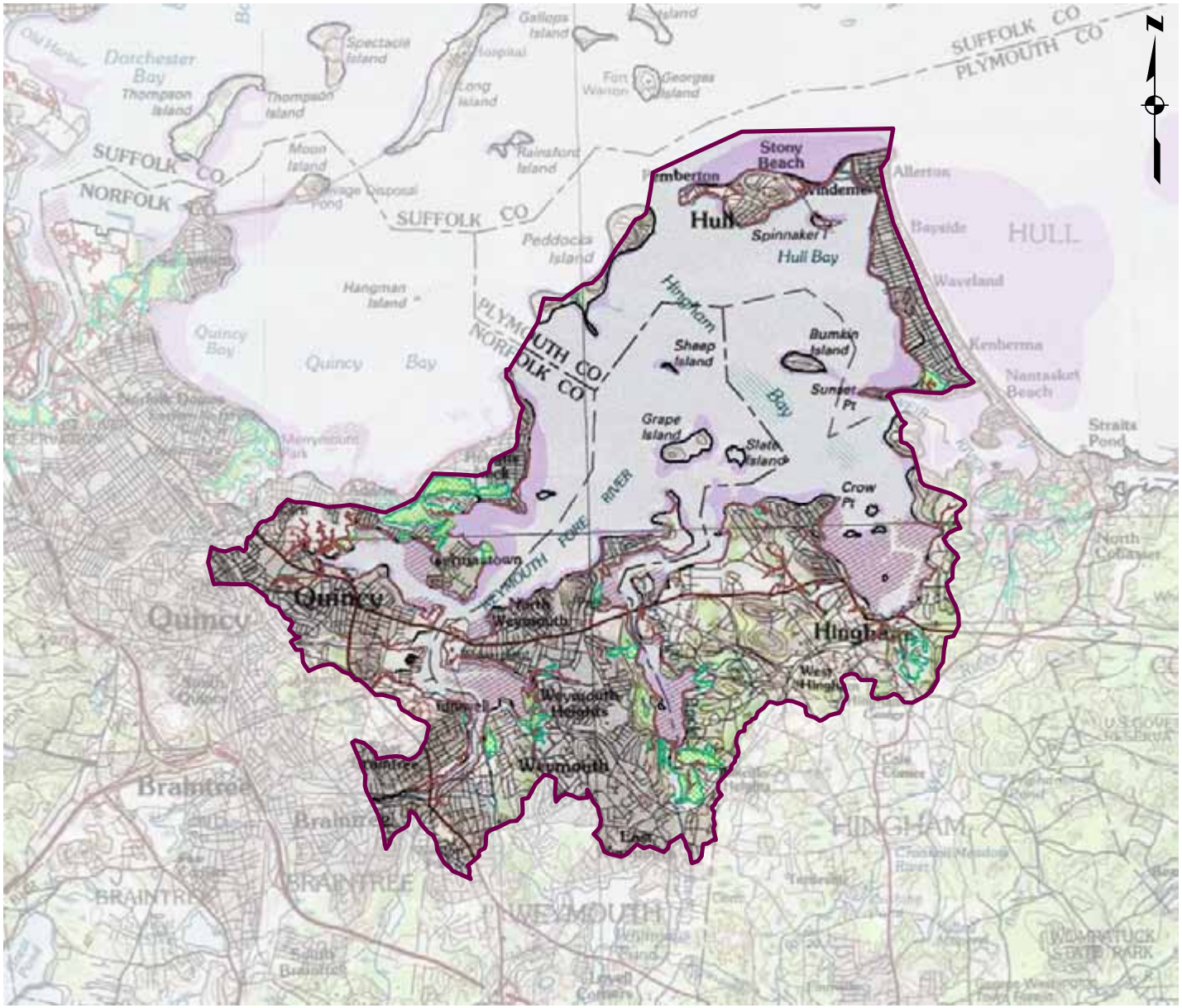

Legend

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BACK RIVER / FORE RIVER / HINGHAM BAY ESTUARINE WATERSHED

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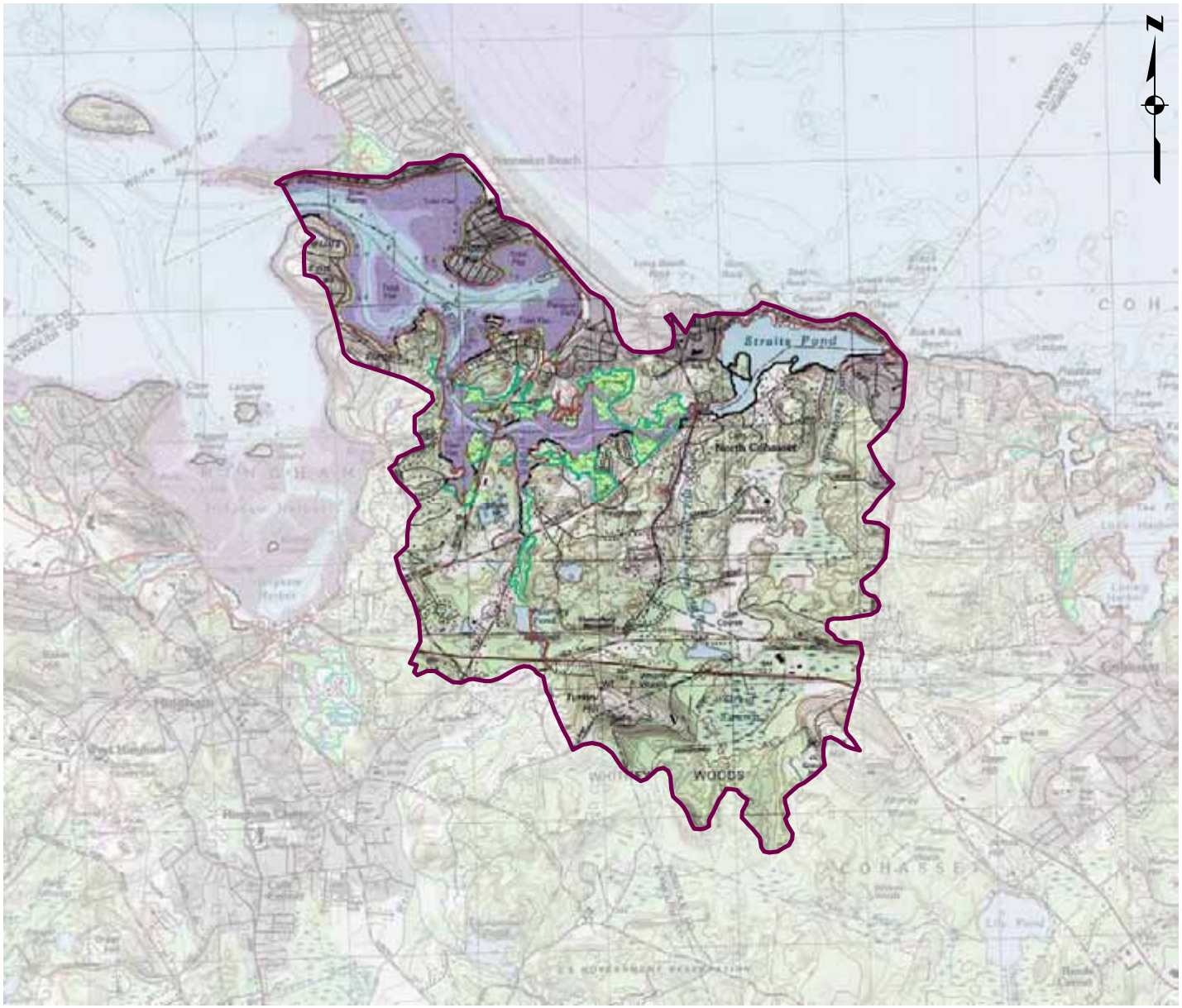

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WEIR RIVER / STRAITS POND ESTUARINE WATERSHED

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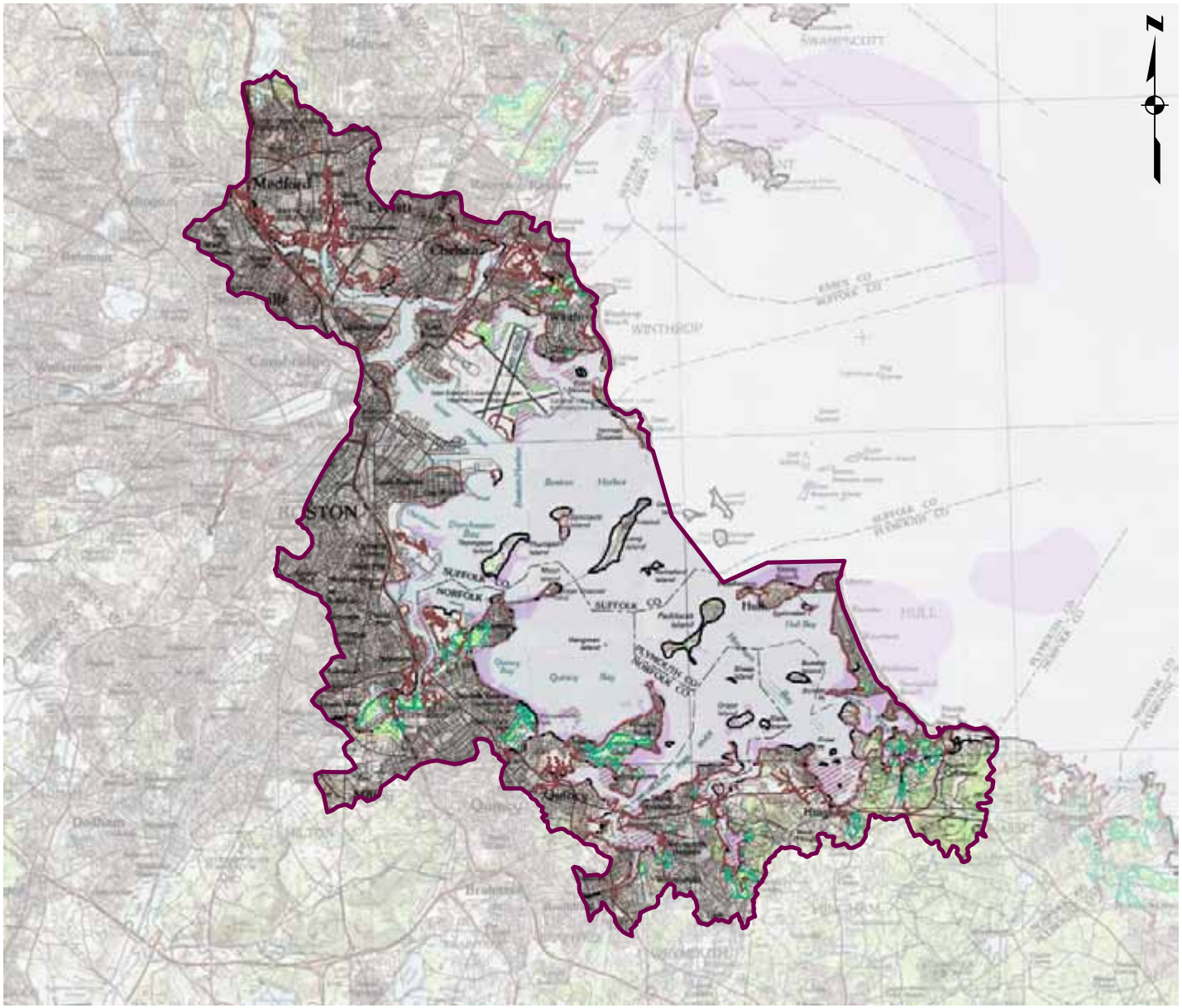

Legend

- Estuarine Watershed Boundary

Landward Boundary Considerations

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BOSTON HARBOR ESTUARINE WATERSHED

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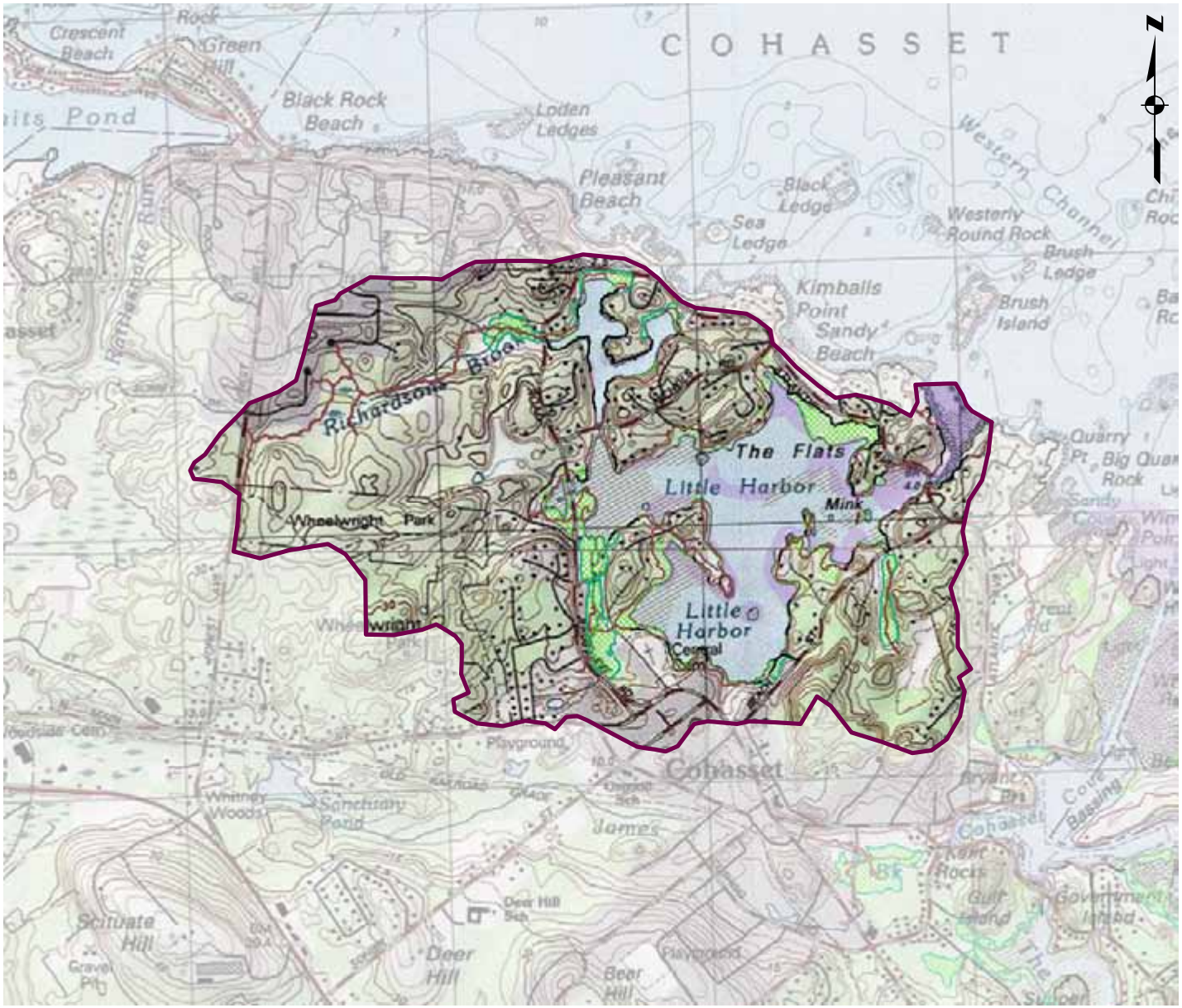

Legend

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Landward Boundary Considerations

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LITTLE HARBOR ESTUARINE WATERSHED

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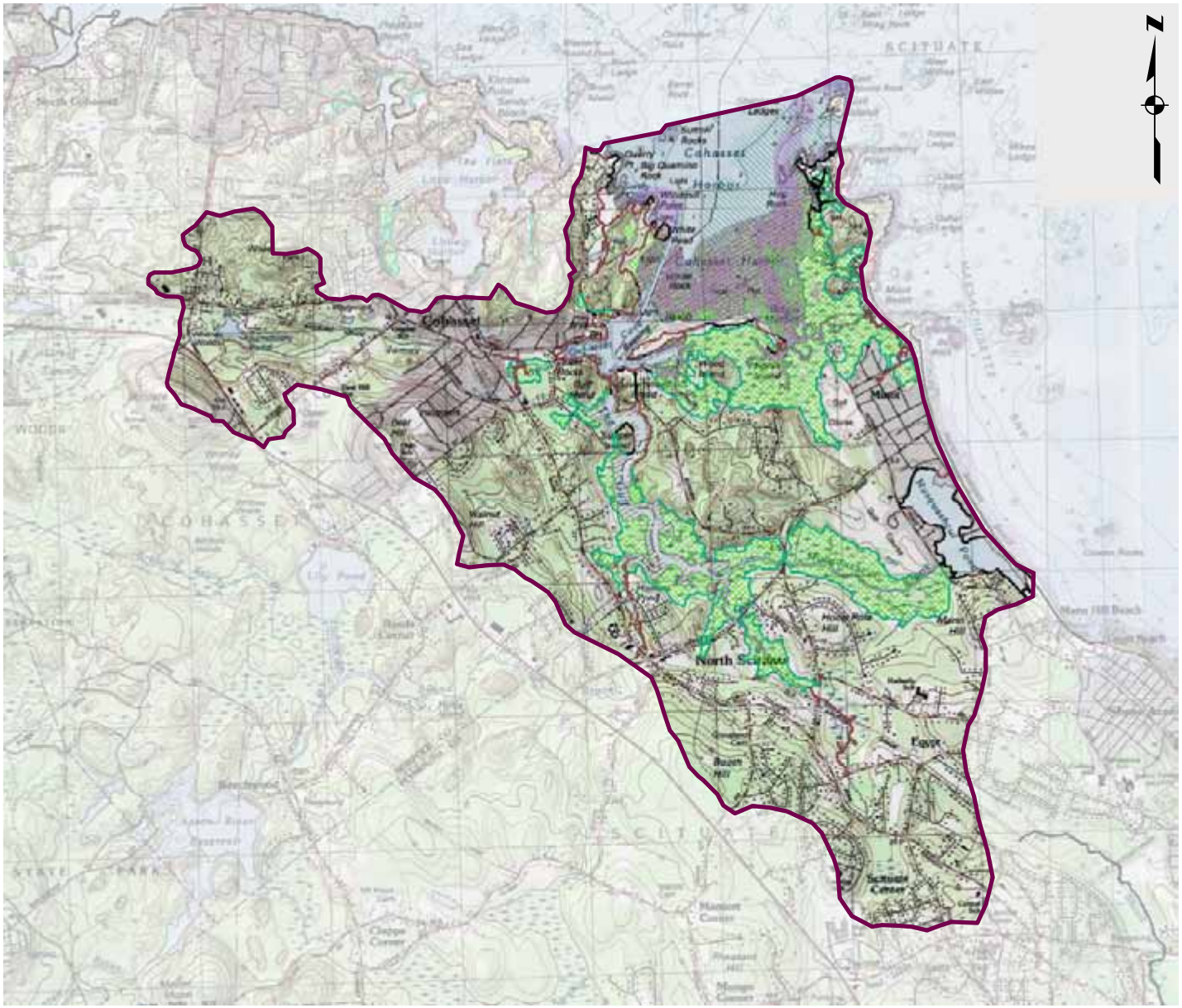

Legend

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COHASSET HARBOR ESTUARINE WATERSHED

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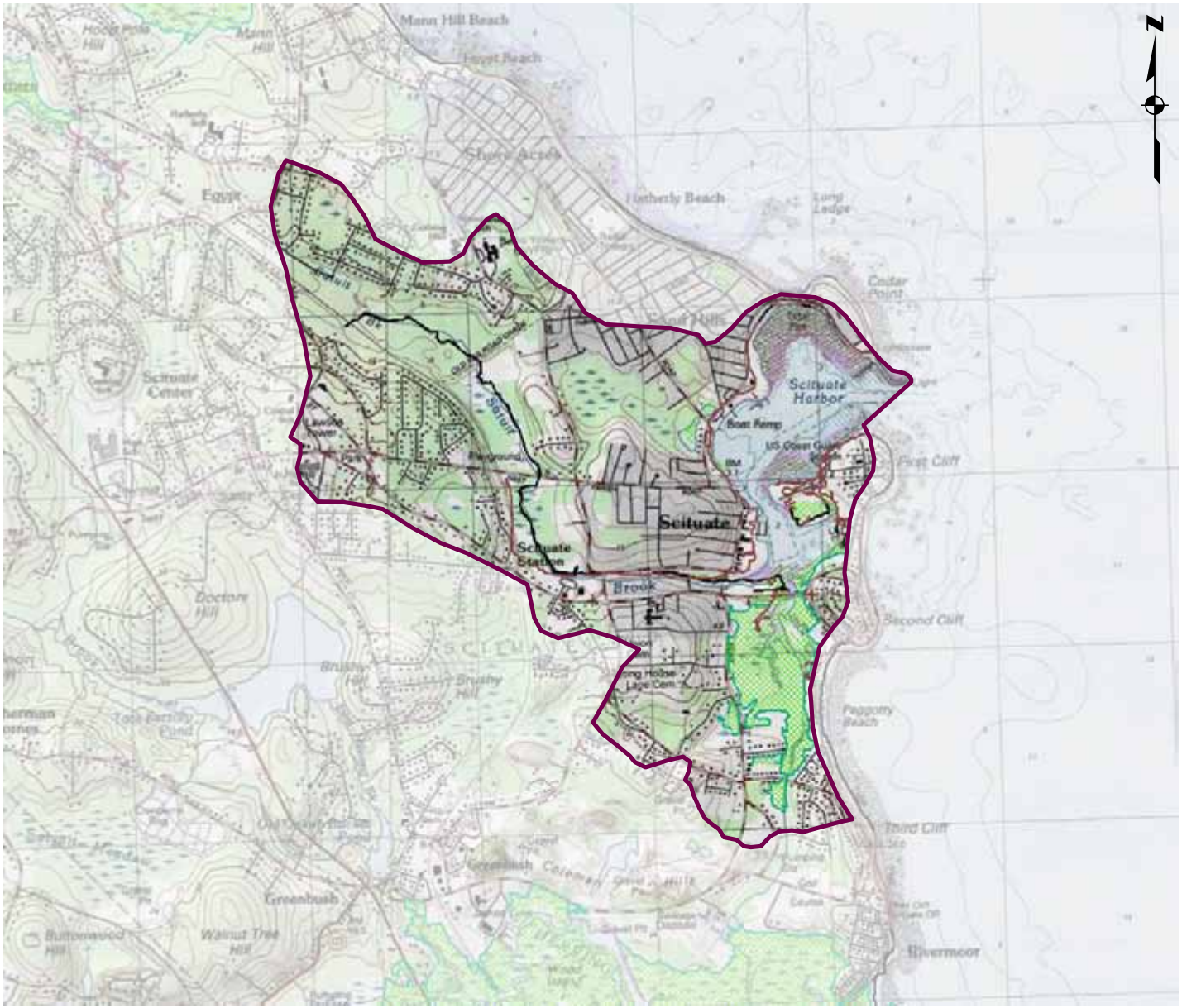

Legend

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SCITUATE HARBOR ESTUARINE WATERSHED

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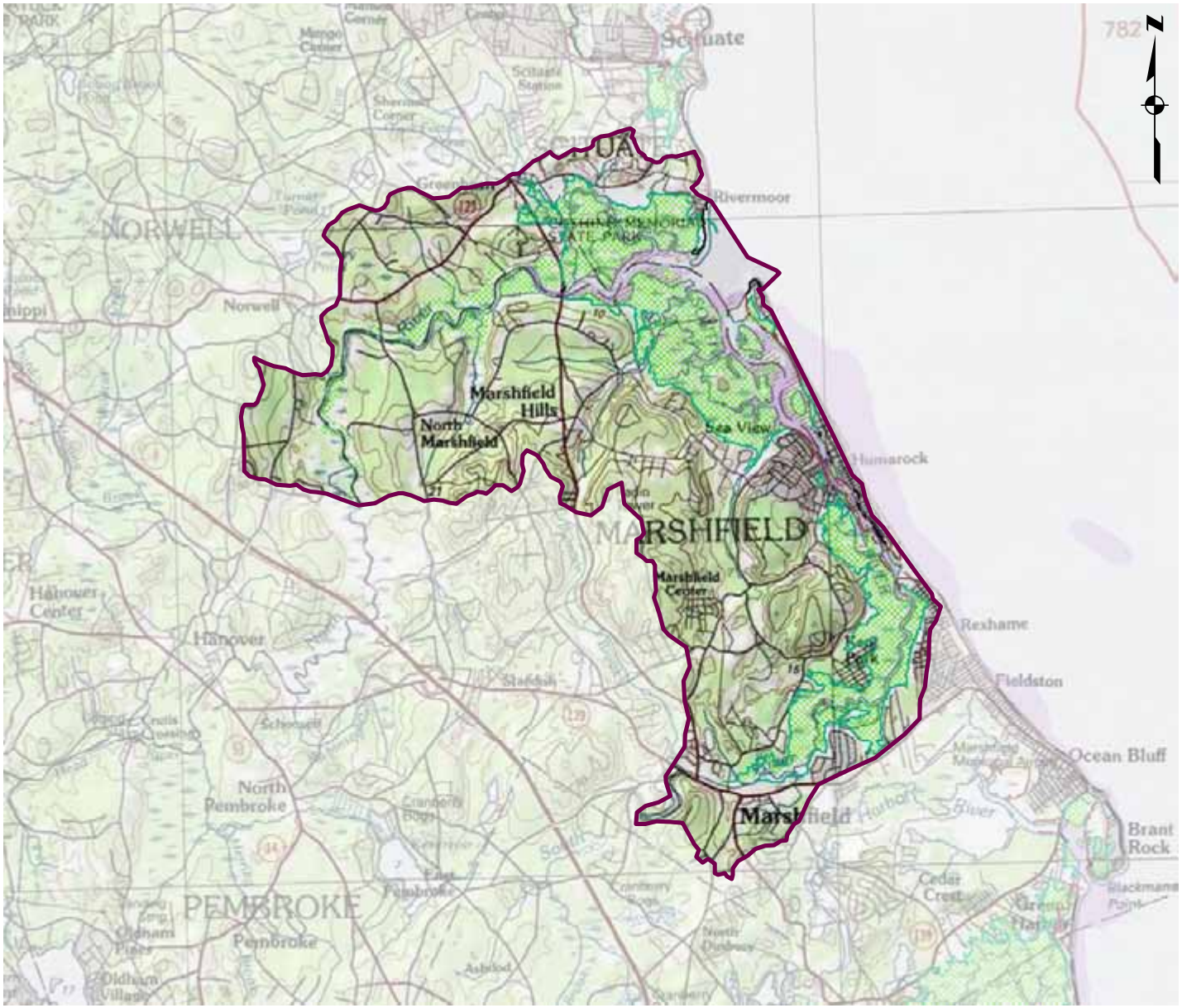

Legend

- Estuarine Watershed Boundary

Landward Boundary Considerations

- Chapter 91 Jurisdiction
- Contemporary High Water
- Marsh Boundary - landward
- Salt Water Wetland

Seaward Boundary Considerations

- Tidal Flats
- Seagrass bed (historic and current)
- Shellfish Suitability (multiple species)

Notes:
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NORTH RIVER / SOUTH RIVER ESTUARINE WATERSHED

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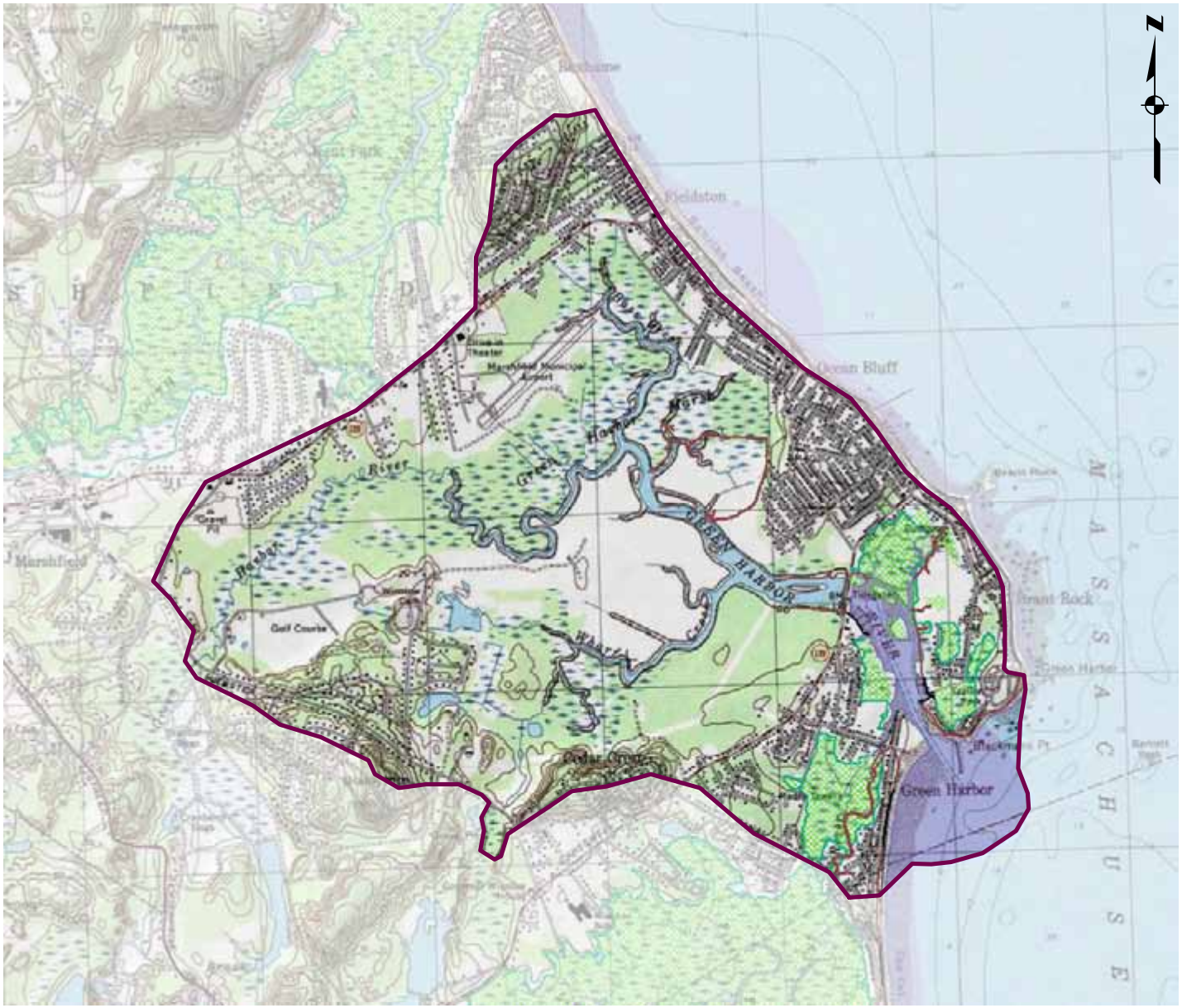

Legend

- Estuarine Watershed Boundary

Landward Boundary Considerations

- Chapter 91 Jurisdiction
- Contemporary High Water
- Marsh Boundary - landward
- Salt Water Wetland

Seaward Boundary Considerations

- Tidal Flats
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GREEN HARBOR ESTUARINE WATERSHED

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Legend

- Estuarine Watershed Boundary

Landward Boundary Considerations

- Chapter 91 Jurisdiction
- Contemporary High Water
- Marsh Boundary - landward
- Salt Water Wetland

Seaward Boundary Considerations

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BLUEFISH RIVER / BACK RIVER / DUXBURY BAY ESTUARINE WATERSHED

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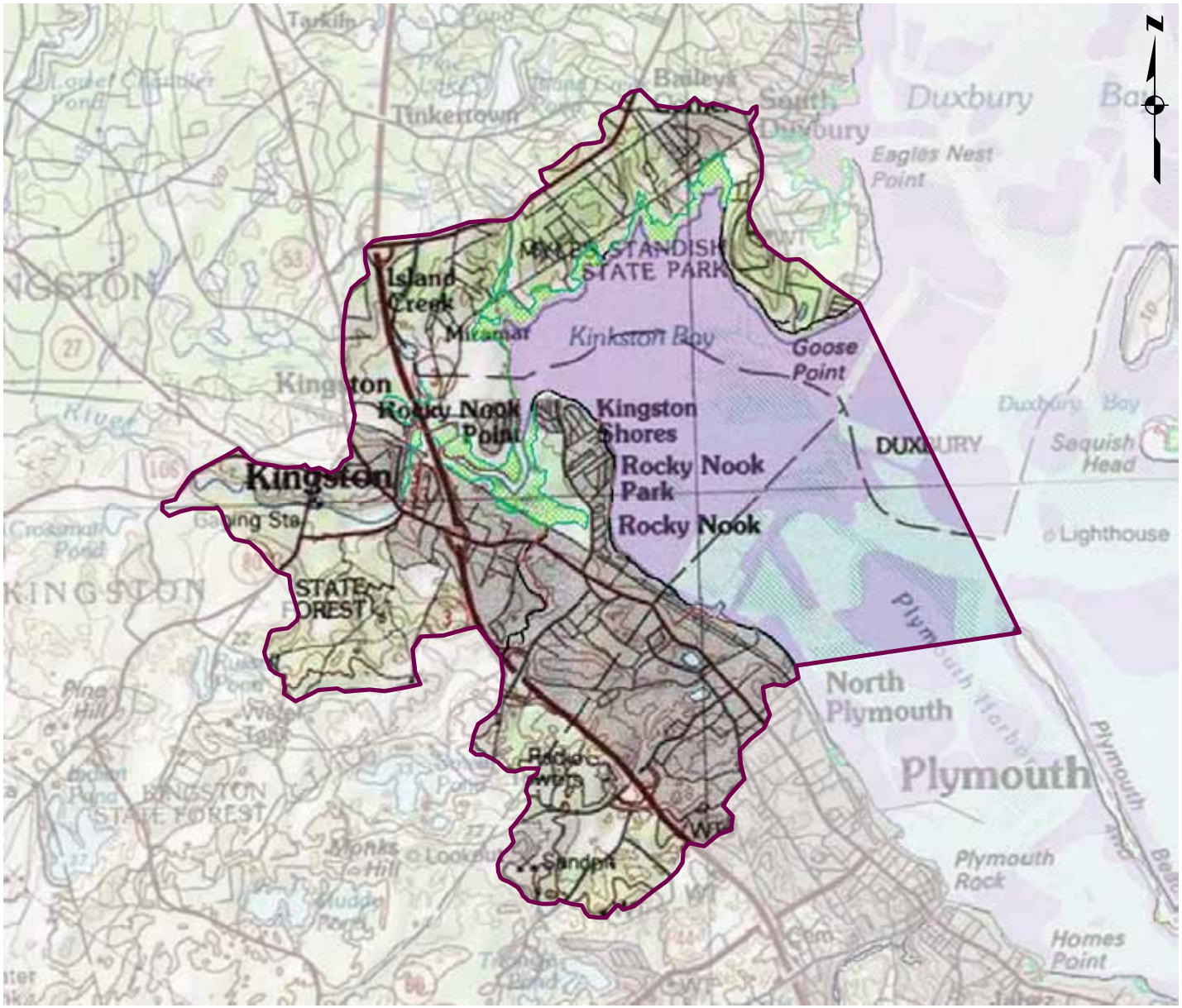

Legend

- Estuarine Watershed Boundary

Landward Boundary Considerations

- Chapter 91 Jurisdiction
- Contemporary High Water
- Marsh Boundary - landward
- Salt Water Wetland

Seaward Boundary Considerations

- Tidal Flats
- Seagrass bed (historic and current)
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JONES RIVER / KINGSTON BAY ESTUARINE WATERSHED

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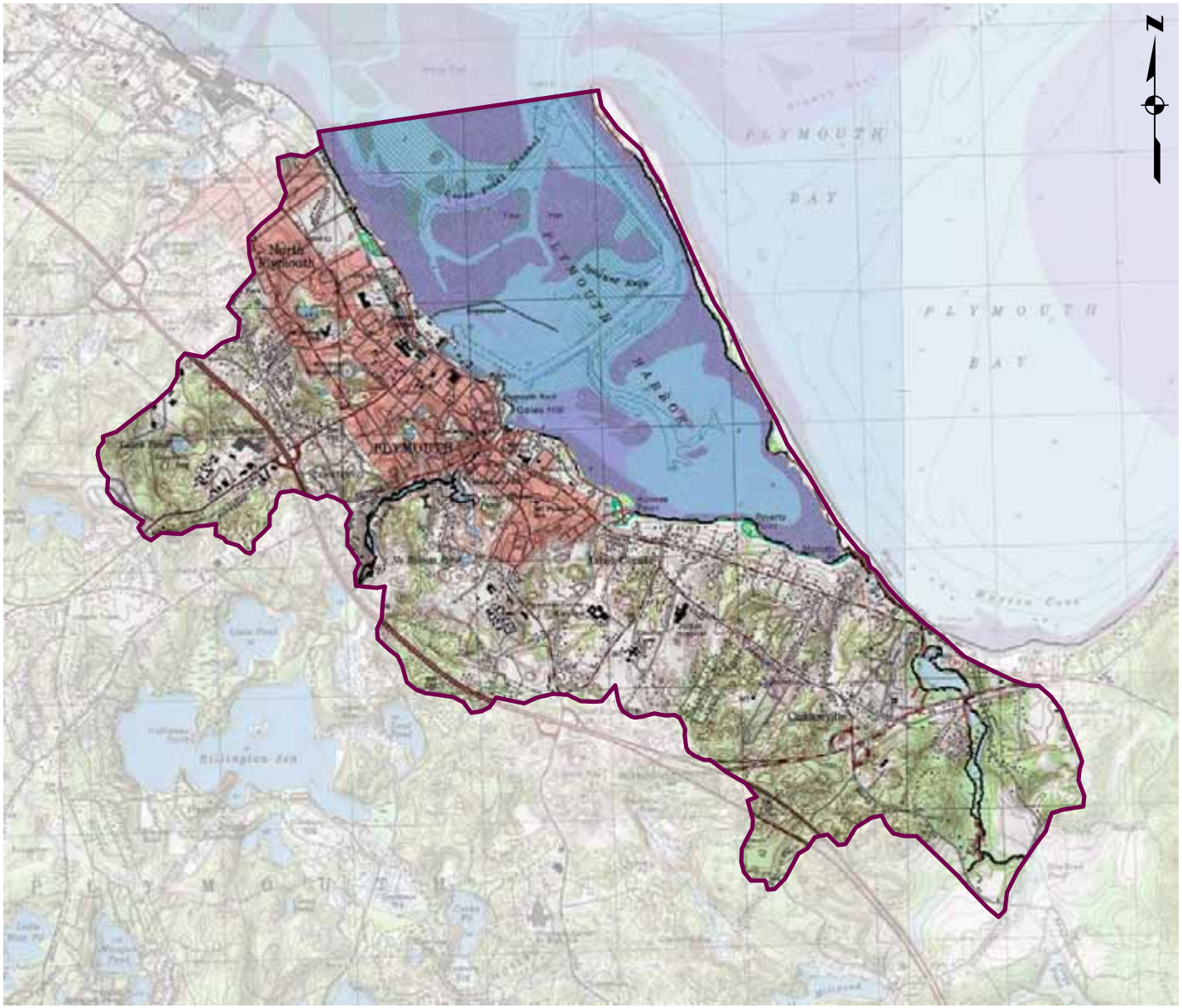

Legend

- Estuarine Watershed Boundary

Landward Boundary Considerations

- Chapter 91 Jurisdiction
- Contemporary High Water
- Marsh Boundary - landward
- Salt Water Wetland

Seaward Boundary Considerations

- Tidal Flats
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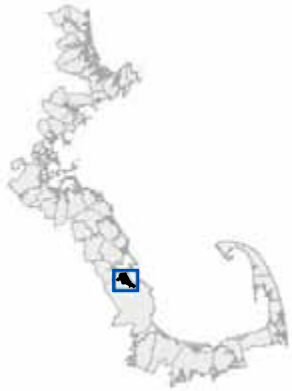

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EEL RIVER / PLYMOUTH HARBOR ESTUARINE WATERSHED

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Legend

- Estuarine Watershed Boundary

Landward Boundary Considerations

- Chapter 91 Jurisdiction
- Contemporary High Water
- Marsh Boundary - landward
- Salt Water Wetland

Seaward Boundary Considerations

- Tidal Flats
- Seagrass bed (historic and current)
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ELLISVILLE HARBOR ESTUARINE WATERSHED

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- Estuarine Watershed Boundary

Landward Boundary Considerations

- Chapter 91 Jurisdiction
- Contemporary High Water
- Marsh Boundary - landward
- Salt Water Wetland

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GREAT HERRING POND / BOURNEDALE ESTUARINE WATERSHED

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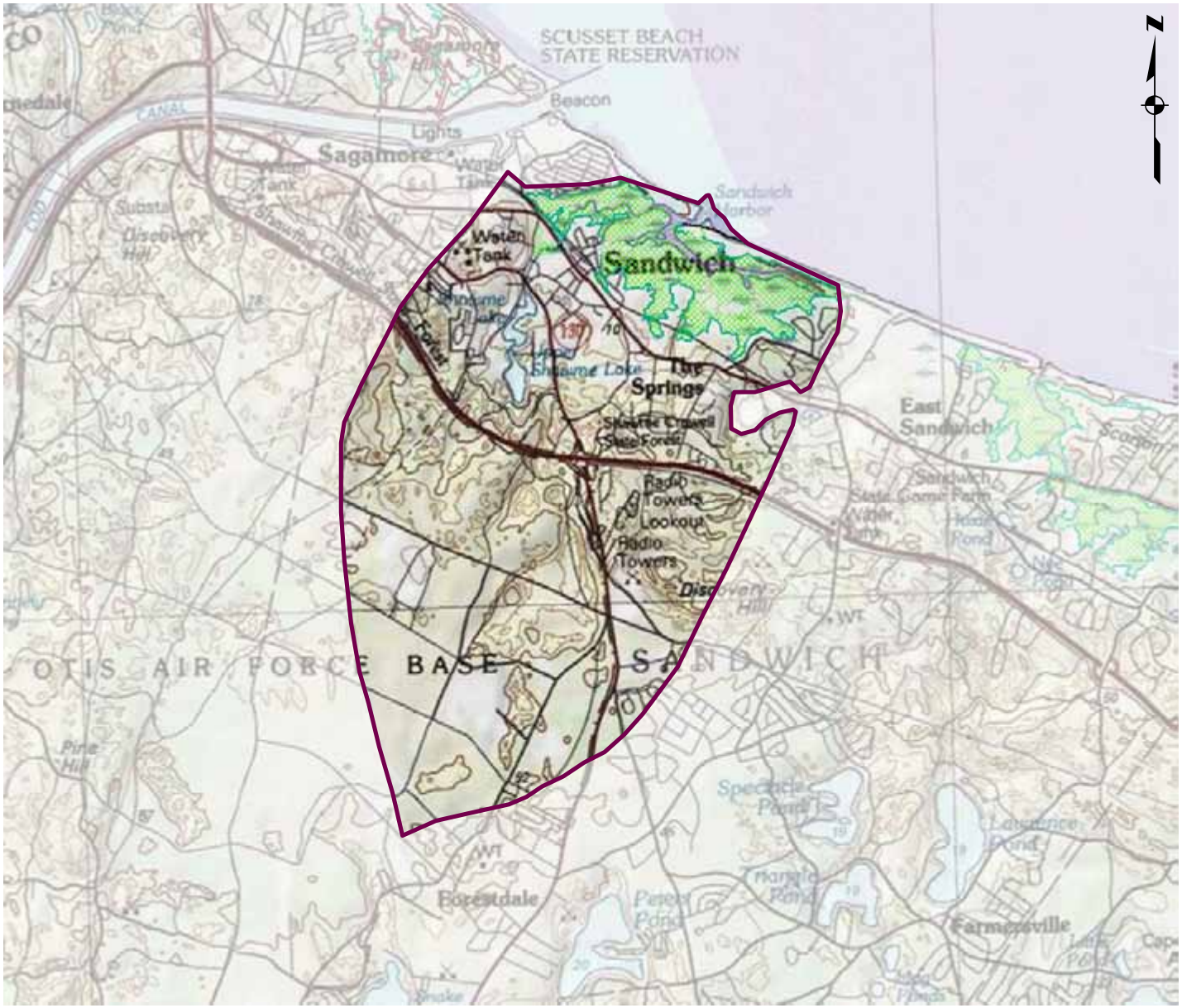

Legend

- Estuarine Watershed Boundary

Landward Boundary Considerations

- Chapter 91 Jurisdiction
- Contemporary High Water
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SANDWICH HARBOR ESTUARINE WATERSHED

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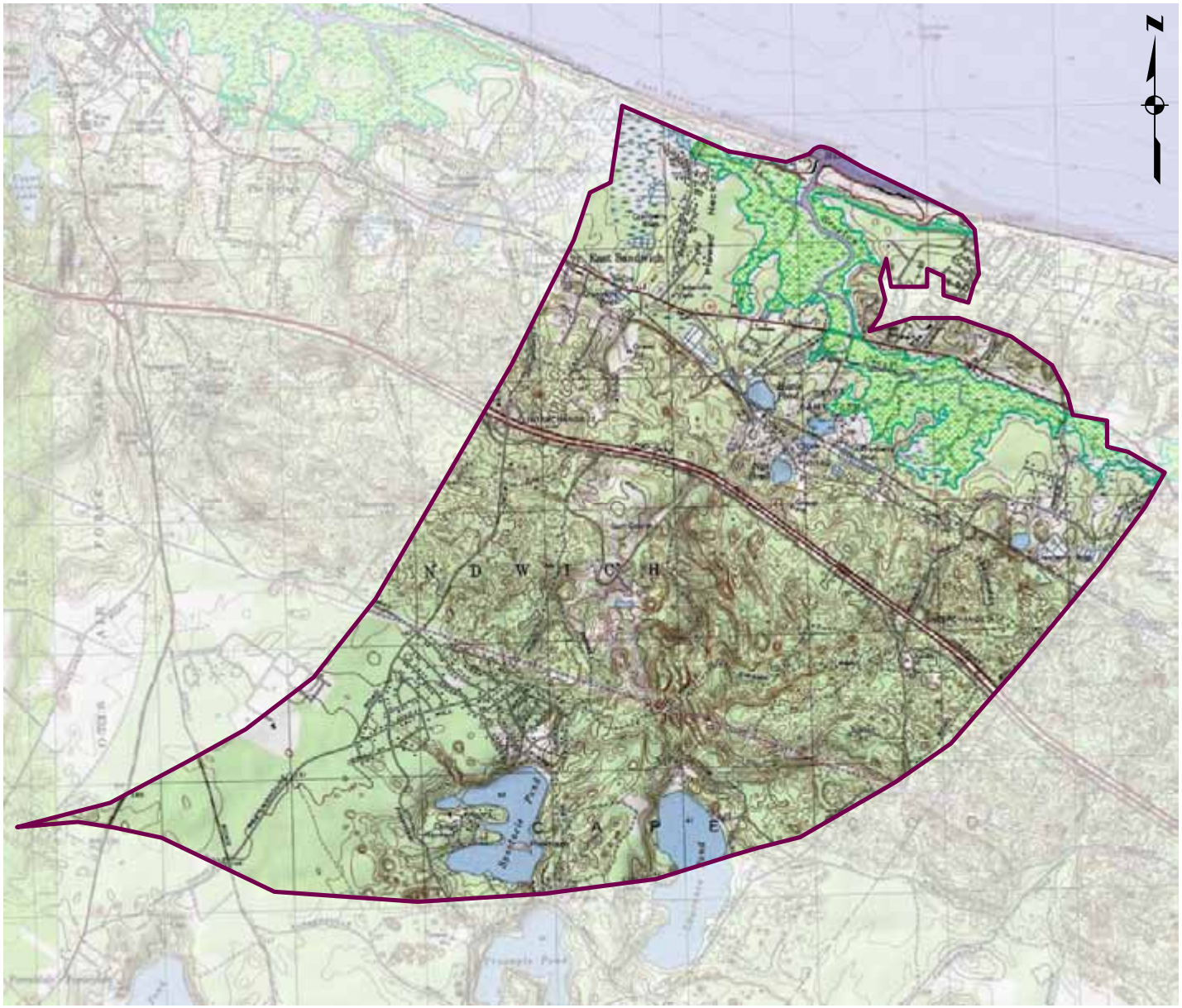

Legend

- Estuarine Watershed Boundary

Landward Boundary Considerations

- Chapter 91 Jurisdiction
- Contemporary High Water
- Marsh Boundary - landward
- Salt Water Wetland

Seaward Boundary Considerations

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SCORTON CREEK ESTUARINE WATERSHED

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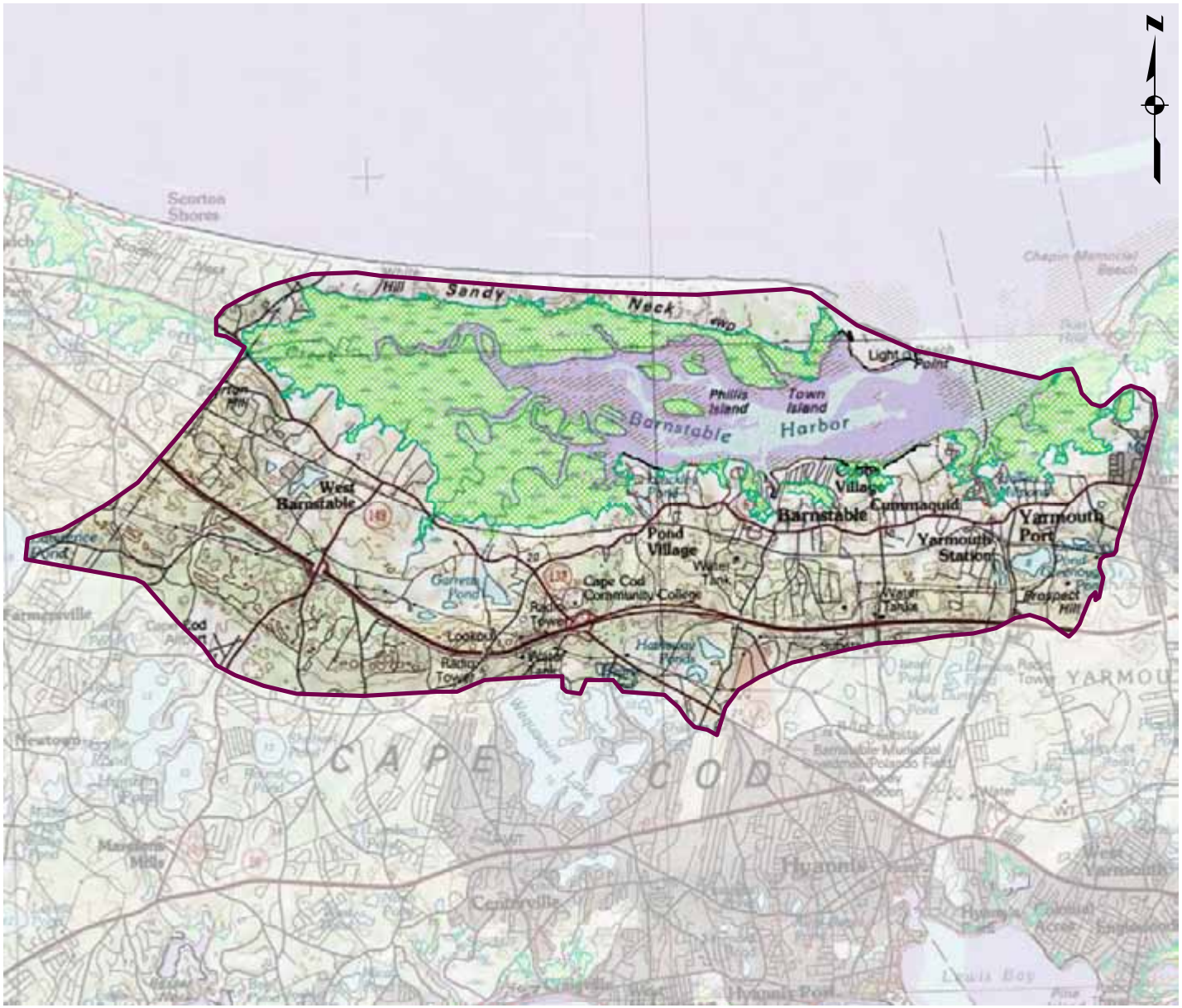

Legend

- Estuarine Watershed Boundary

Landward Boundary Considerations

- Chapter 91 Jurisdiction
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- Salt Water Wetland

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BARNSTABLE HARBOR ESTUARINE WATERSHED

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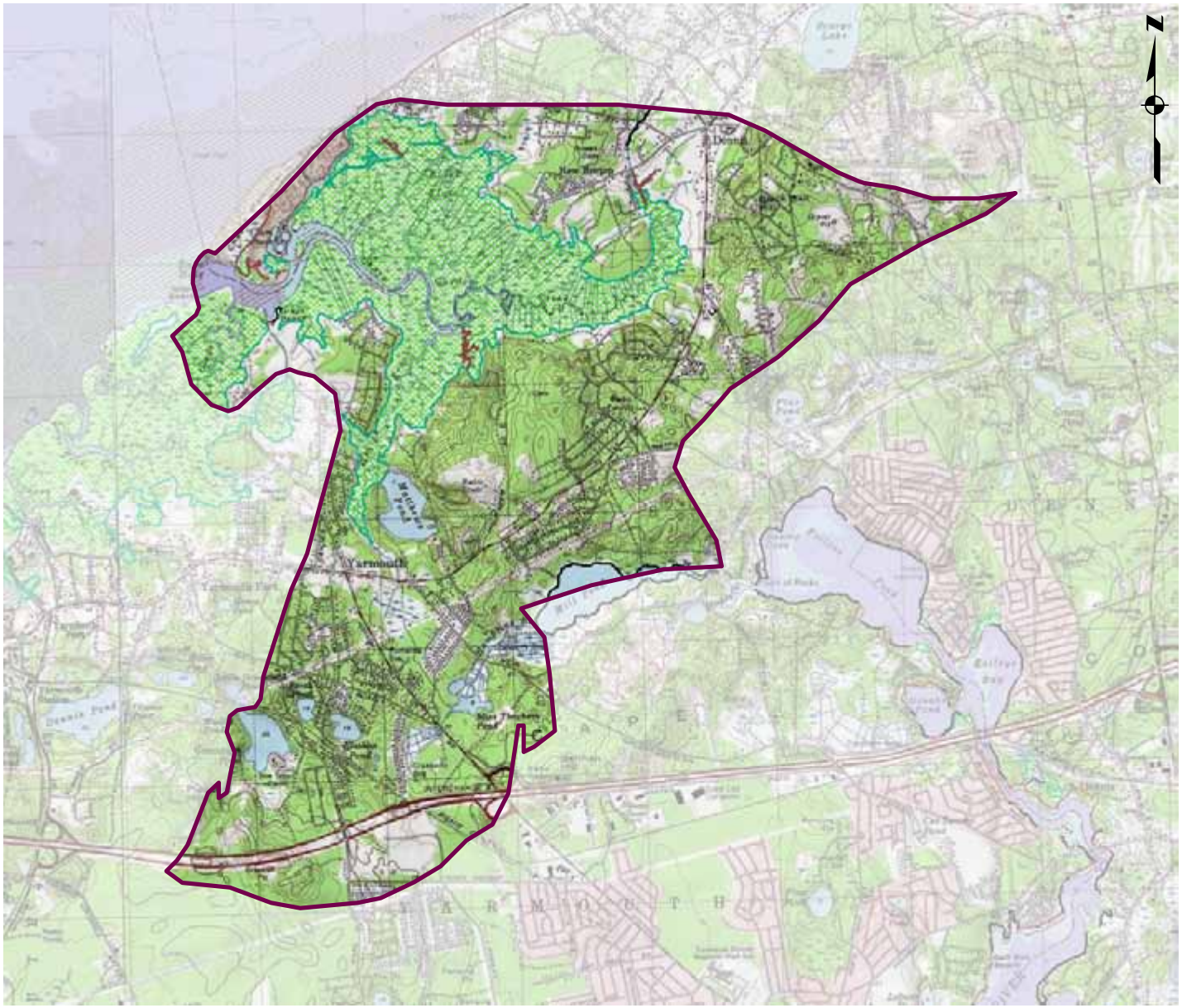

Legend

- Estuarine Watershed Boundary

Landward Boundary Considerations

- Chapter 91 Jurisdiction
- Contemporary High Water
- Marsh Boundary - landward
- Salt Water Wetland

Seaward Boundary Considerations

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CHASE GARDEN CREEK ESTUARINE WATERSHED

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Legend

- Estuarine Watershed Boundary

Landward Boundary Considerations

- Chapter 91 Jurisdiction
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SESUIT CREEK / SESUIT HARBOR ESTUARINE WATERSHED

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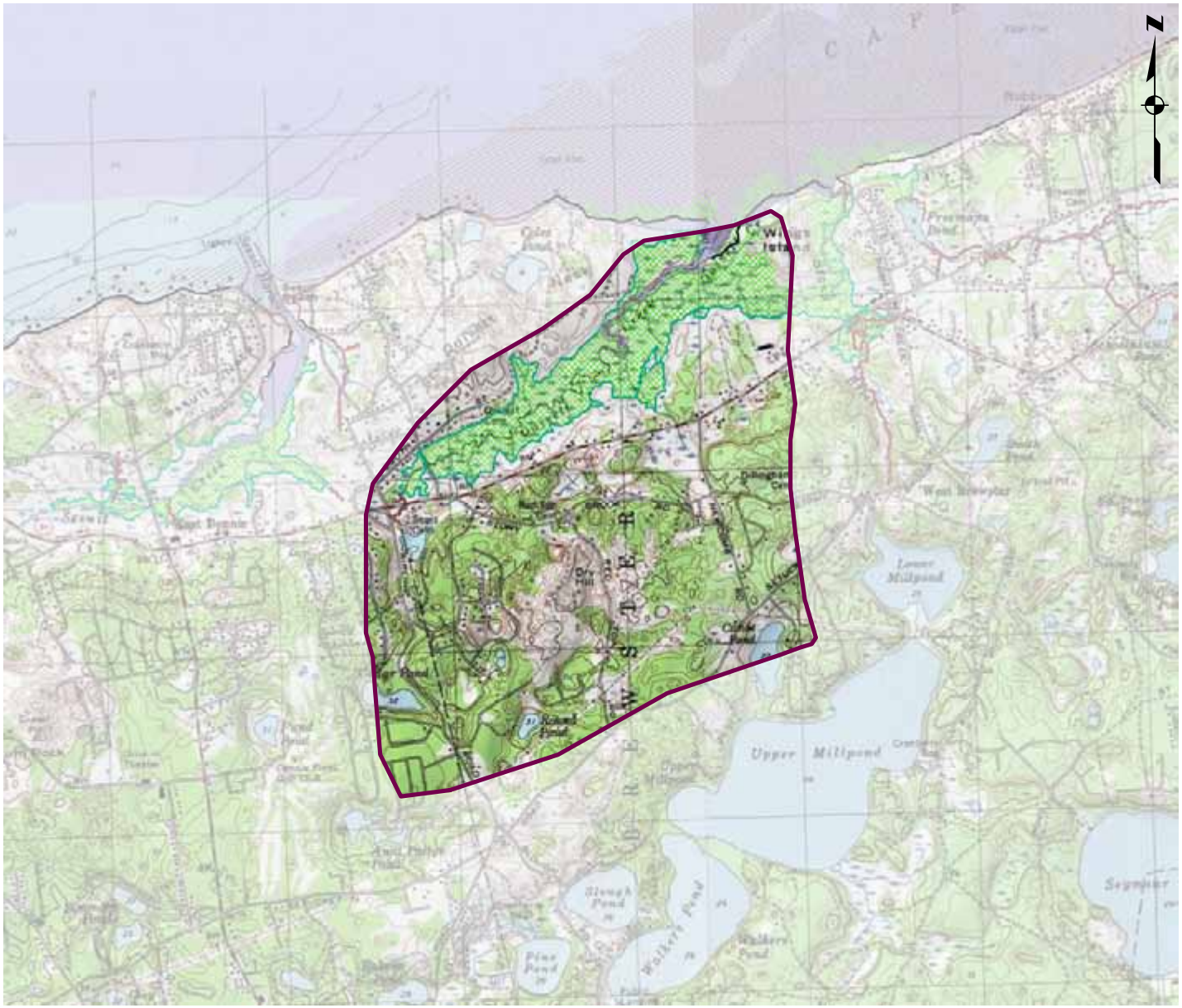

Legend

- Estuarine Watershed Boundary

Landward Boundary Considerations

- Chapter 91 Jurisdiction
- Contemporary High Water
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- Salt Water Wetland

Seaward Boundary Considerations

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Estuary Assessment and Delineation

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QUIVETT CREEK ESTUARINE WATERSHED

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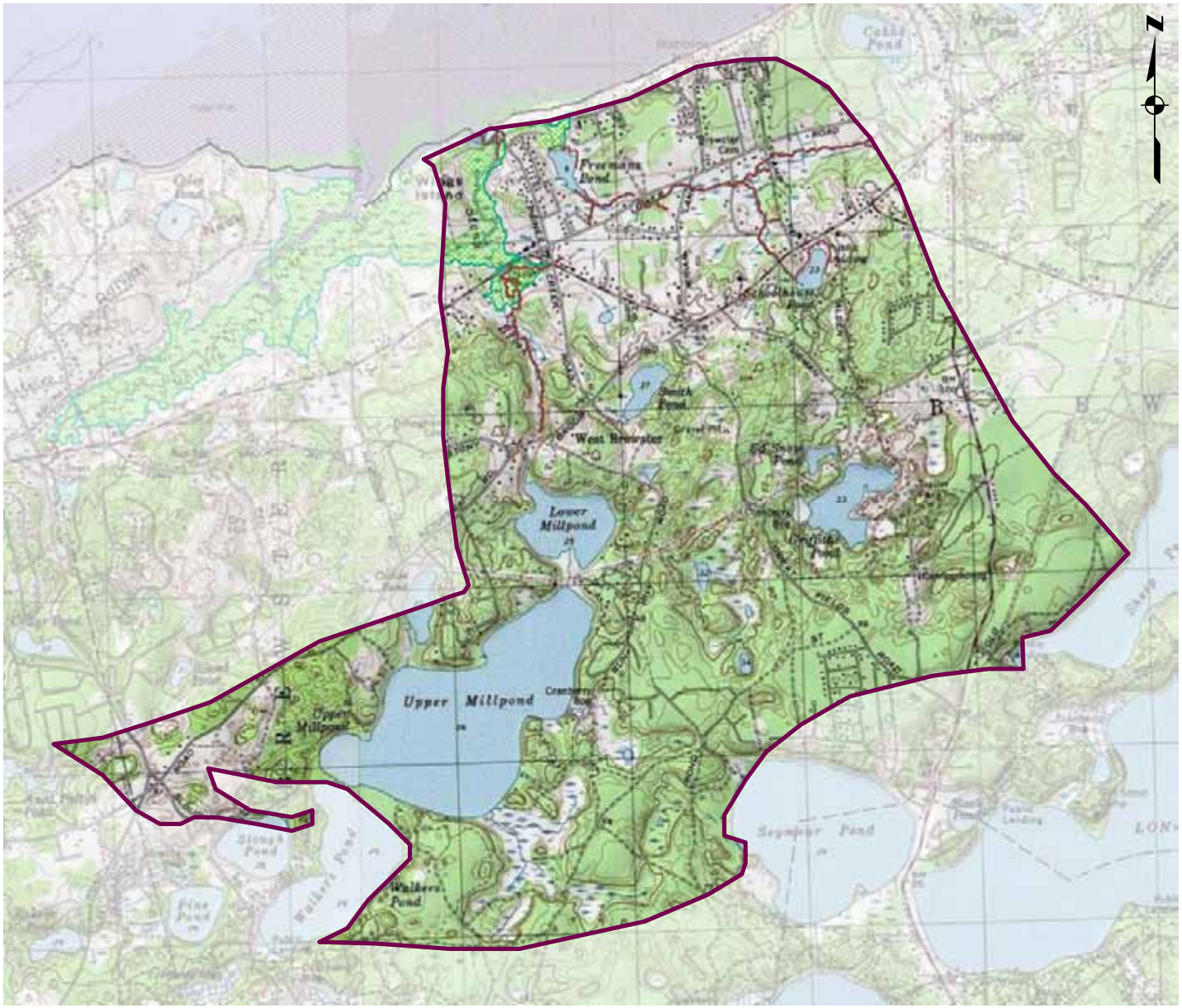

Legend

- Estuarine Watershed Boundary

Landward Boundary Considerations

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- Salt Water Wetland

Seaward Boundary Considerations

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PAINE'S CREEK / STONY BROOK ESTUARINE WATERSHED

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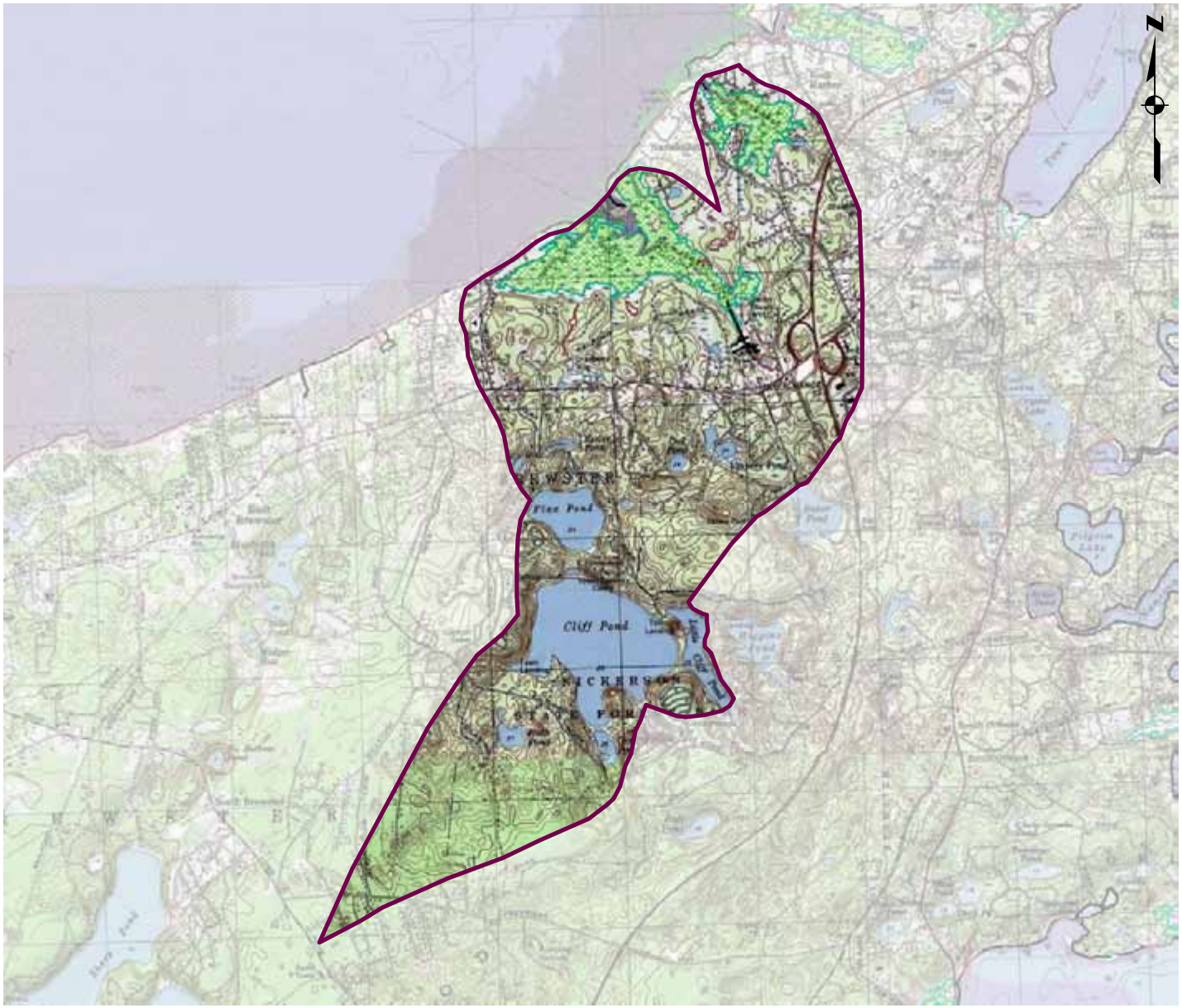

Legend

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NAMSKAKET CREEK / LITTLE NAMSKAKET CREEK ESTUARINE WATERSHED

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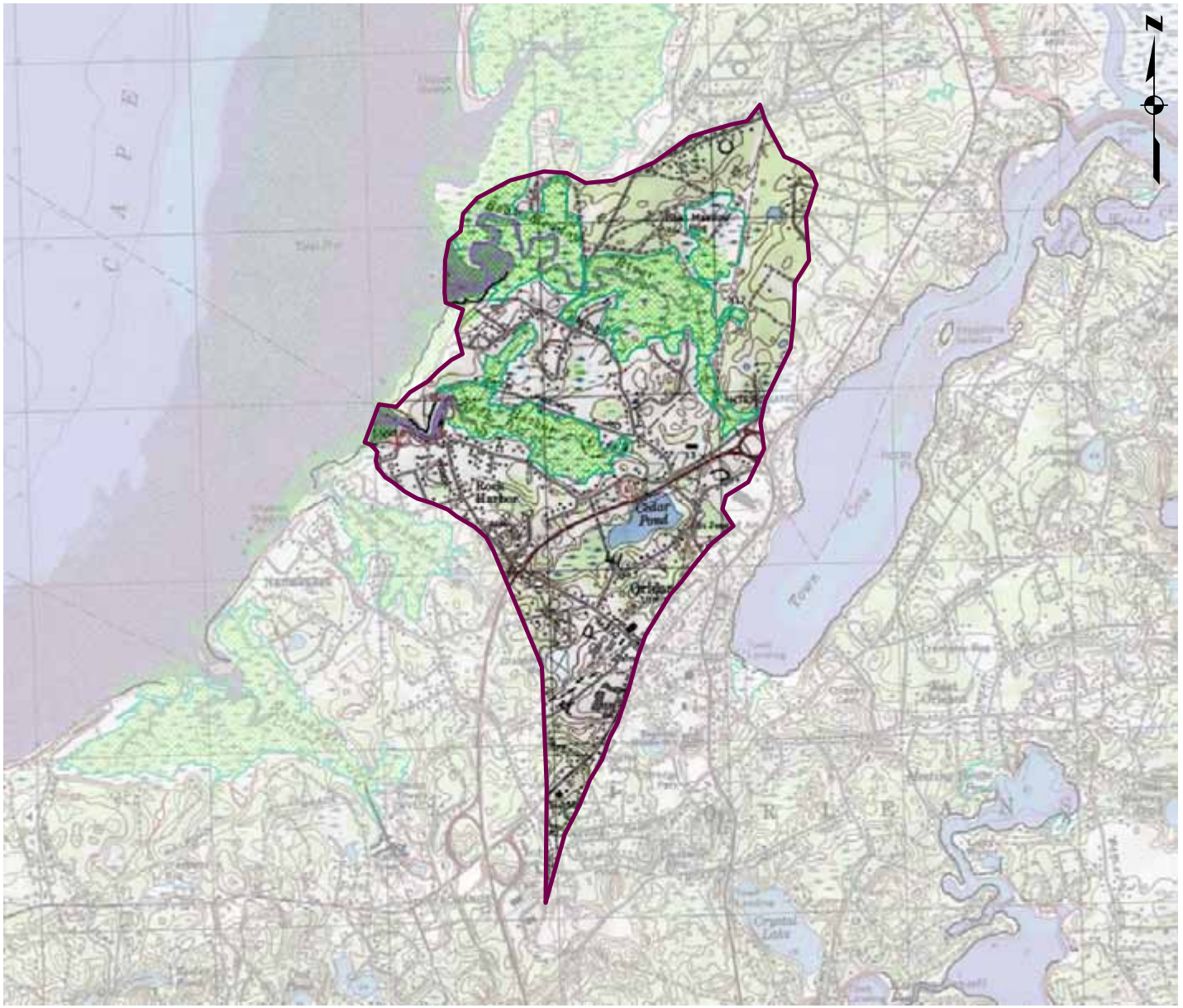

Legend

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BOAT MEADOW CREEK / ROCK HARBOR ESTUARINE WATERSHED

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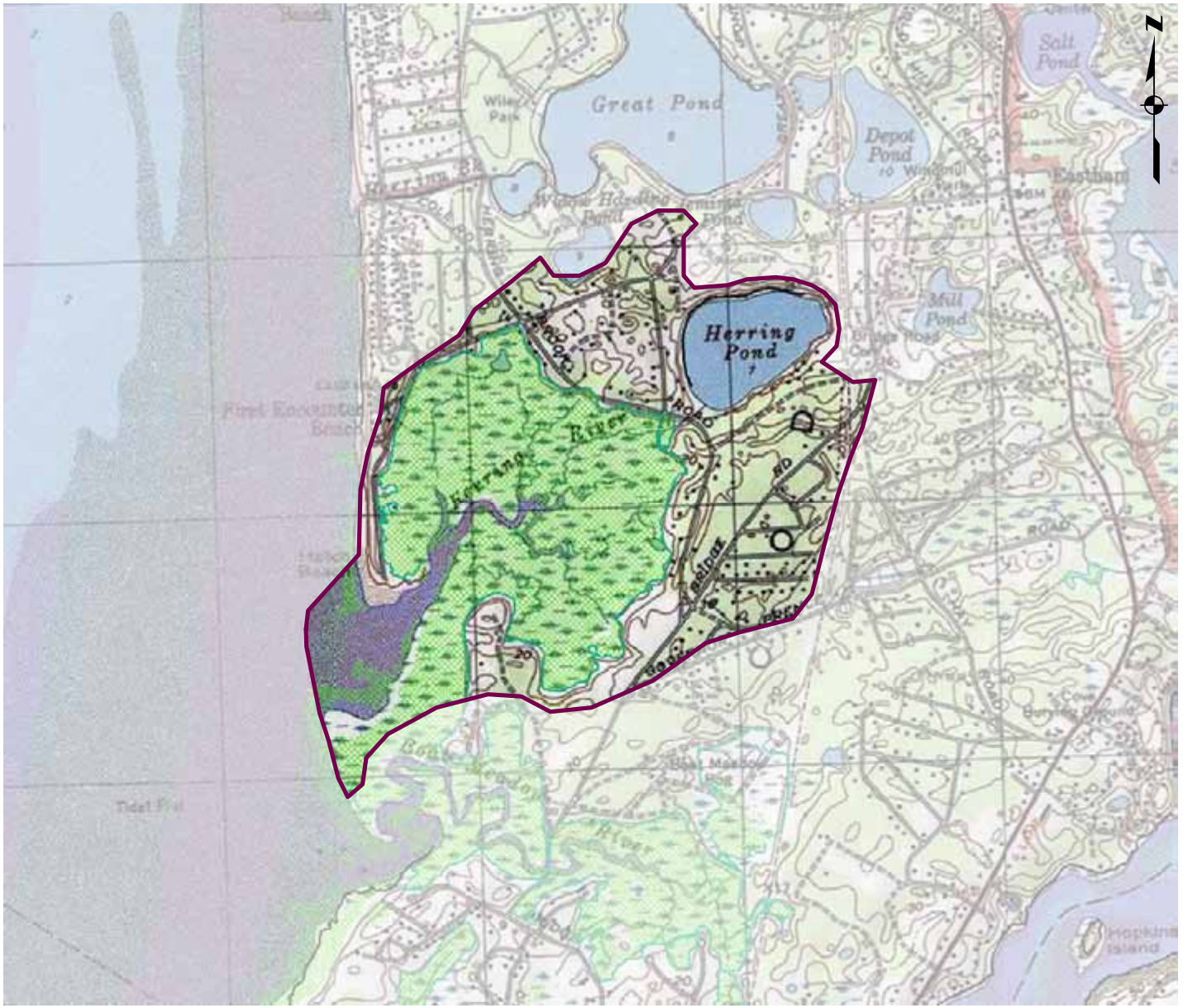

Legend

- Estuarine Watershed Boundary

Landward Boundary Considerations

- Chapter 91 Jurisdiction
- Contemporary High Water
- Marsh Boundary - landward
- Salt Water Wetland

Seaward Boundary Considerations

- Tidal Flats
- Seagrass bed (historic and current)
- Shellfish Suitability (multiple species)

Notes:
1. Seaward boundaries were first determined using Massachusetts 305(b) water body delineations and then expanded to include nearby tidal flats, shellfish habitat, and seagrass beds.
2. Landward boundaries were determined using pre-delineated watershed boundaries prepared by USGS. In some cases, the head of the tide along major tributaries was determined using maps of Chapter 91 Jurisdiction, as well as land use data showing the extent of salt marshes. Landward boundaries were then adjusted to remove major freshwater contributing watersheds.
3. Watersheds on Cape Cod reflect groundwater contributing areas. They were primarily interpreted using the results of a USGS groundwater model and were adjusted using data from Massachusetts Estuaries Project reports, USGS maps, and Cape Cod Commission watershed boundaries.
4. A full list of data sources is available in Appendix I: GIS Data Sources.

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HERRING RIVER / HERRING POND ESTUARINE WATERSHED

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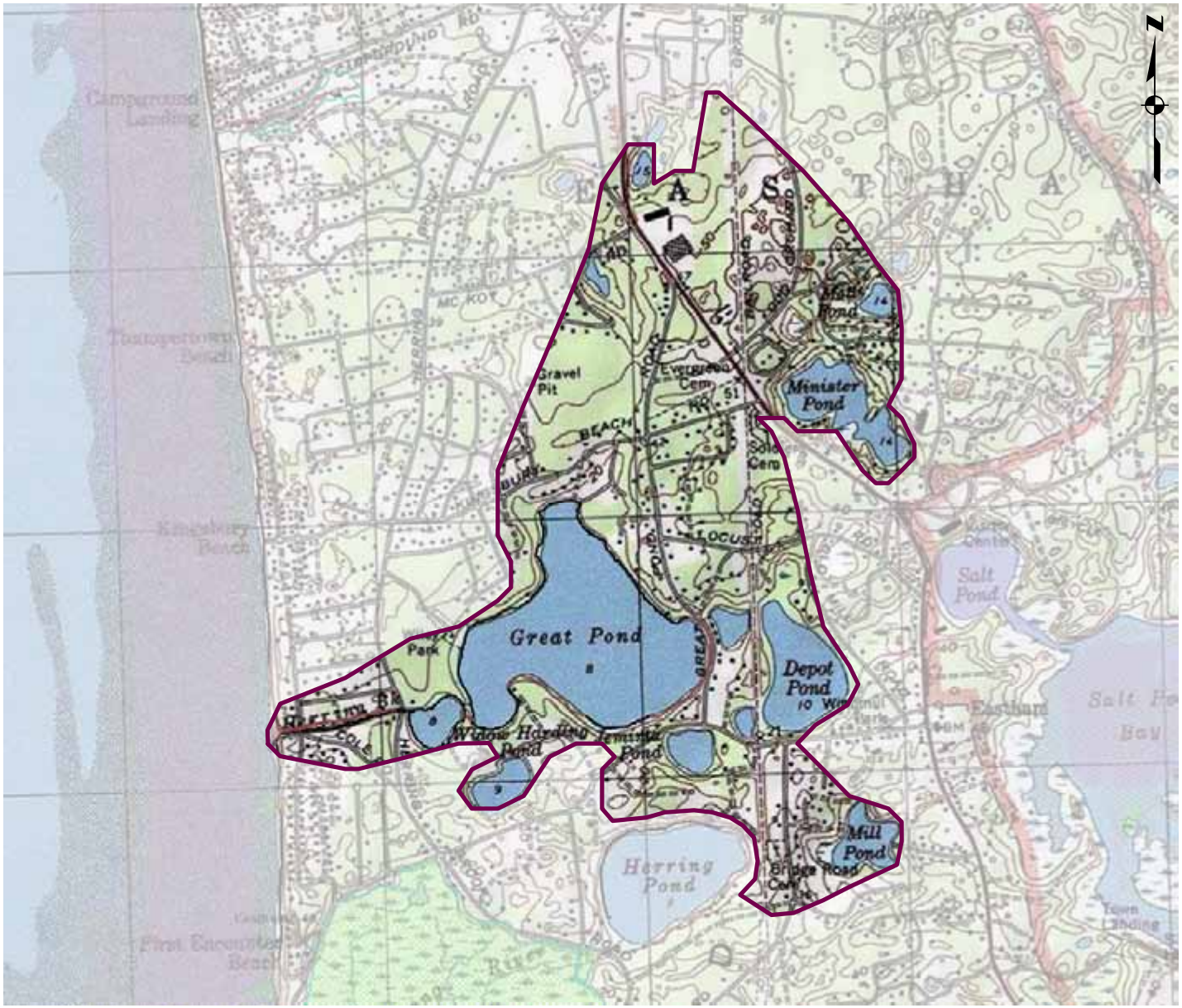

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Legend

- Estuarine Watershed Boundary

Landward Boundary Considerations

- Chapter 91 Jurisdiction
- Contemporary High Water
- Marsh Boundary - landward
- Salt Water Wetland

Seaward Boundary Considerations

- Tidal Flats
- Seagrass bed (historic and current)
- Shellfish Suitability (multiple species)

Notes:
1. Seaward boundaries were first determined using Massachusetts 305(b) water body delineations and then expanded to include nearby tidal flats, shellfish habitat, and seagrass beds.
2. Landward boundaries were determined using pre-delineated watershed boundaries prepared by USGS. In some cases, the head of the tide along major tributaries was determined using maps of Chapter 91 Jurisdiction, as well as land use data showing the extent of salt marshes. Landward boundaries were then adjusted to remove major freshwater contributing watersheds.
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HERRING BROOK / GREAT POND ESTUARINE WATERSHED

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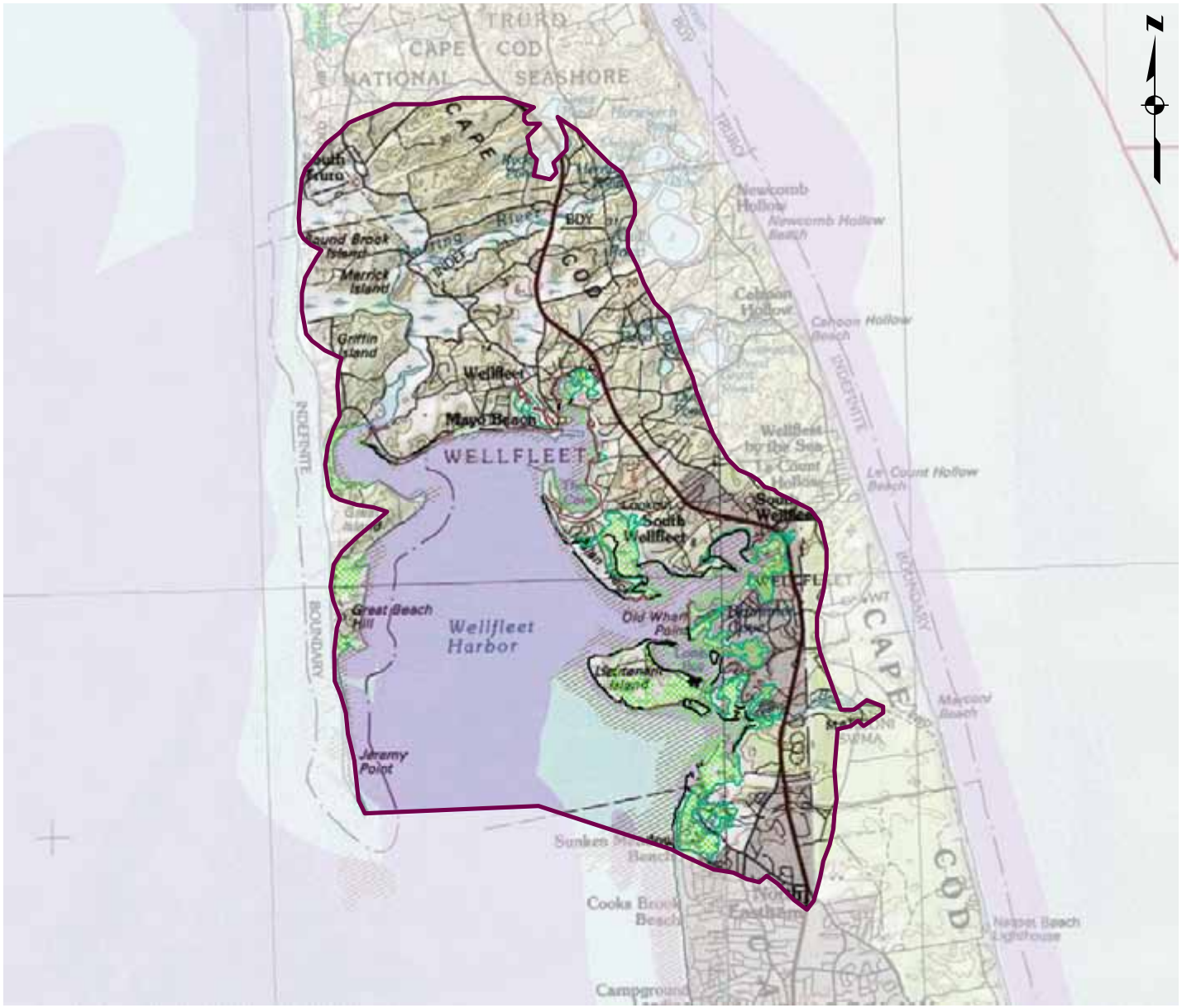

Legend

- Estuarine Watershed Boundary

Landward Boundary Considerations

- Chapter 91 Jurisdiction
- Contemporary High Water
- Marsh Boundary - landward
- Salt Water Wetland

Seaward Boundary Considerations

- Tidal Flats
- Seagrass bed (historic and current)
- Shellfish Suitability (multiple species)

Notes:
1. Seaward boundaries were first determined using Massachusetts 305(b) water body delineations and then expanded to include nearby tidal flats, shellfish habitat, and seagrass beds.
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WELLFLEET HARBOR ESTUARINE WATERSHED

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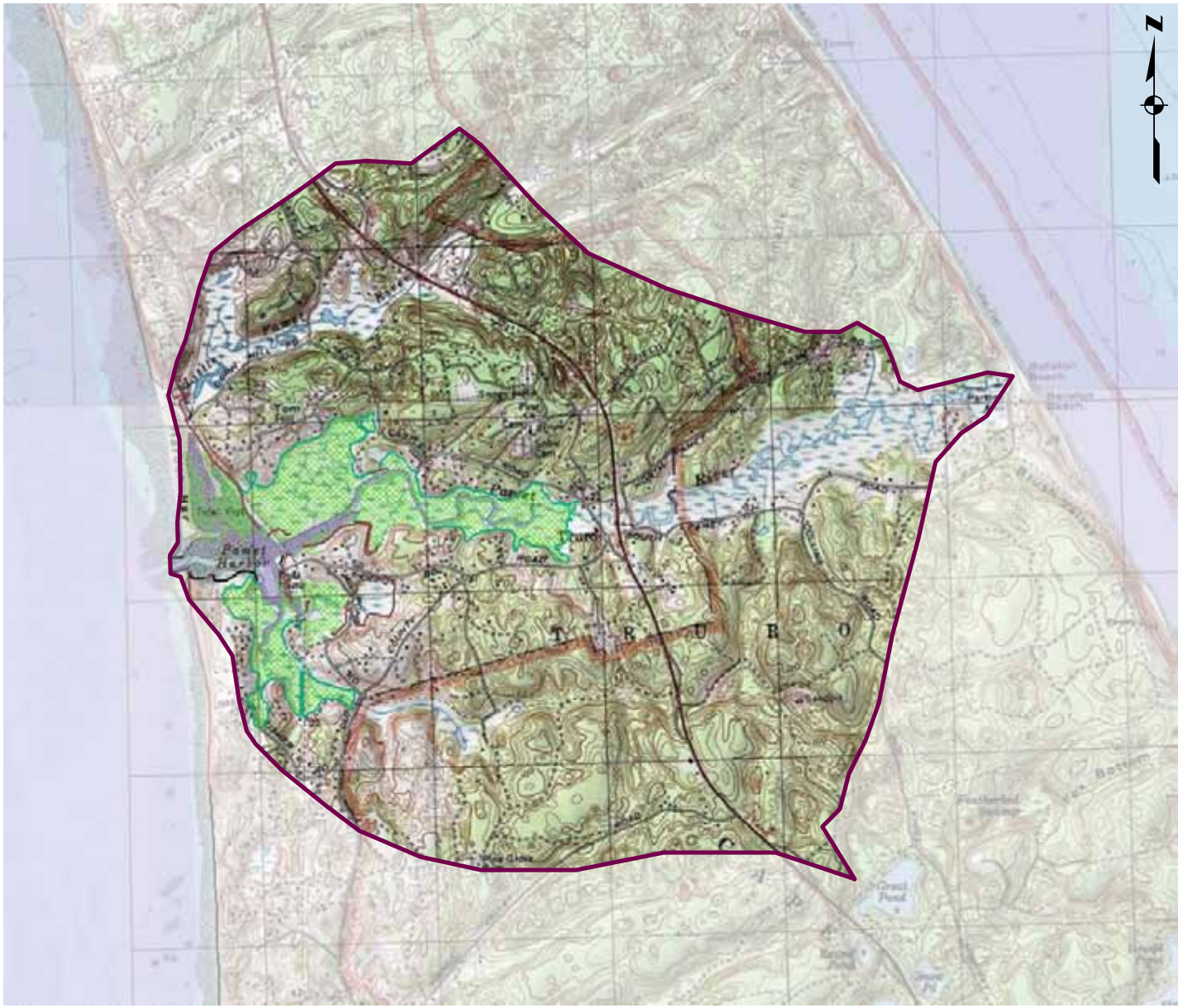

Legend

- Estuarine Watershed Boundary

Landward Boundary Considerations

- Chapter 91 Jurisdiction
- Contemporary High Water
- Marsh Boundary - landward
- Salt Water Wetland

Seaward Boundary Considerations

- Tidal Flats
- Seagrass bed (historic and current)
- Shellfish Suitability (multiple species)

Notes:
1. Seaward boundaries were first determined using Massachusetts 305(b) water body delineations and then expanded to include nearby tidal flats, shellfish habitat, and seagrass beds.
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4. A full list of data sources is available in Appendix I: GIS Data Sources.

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PAMET RIVER / LITTLE PAMET RIVER ESTUARINE WATERSHED

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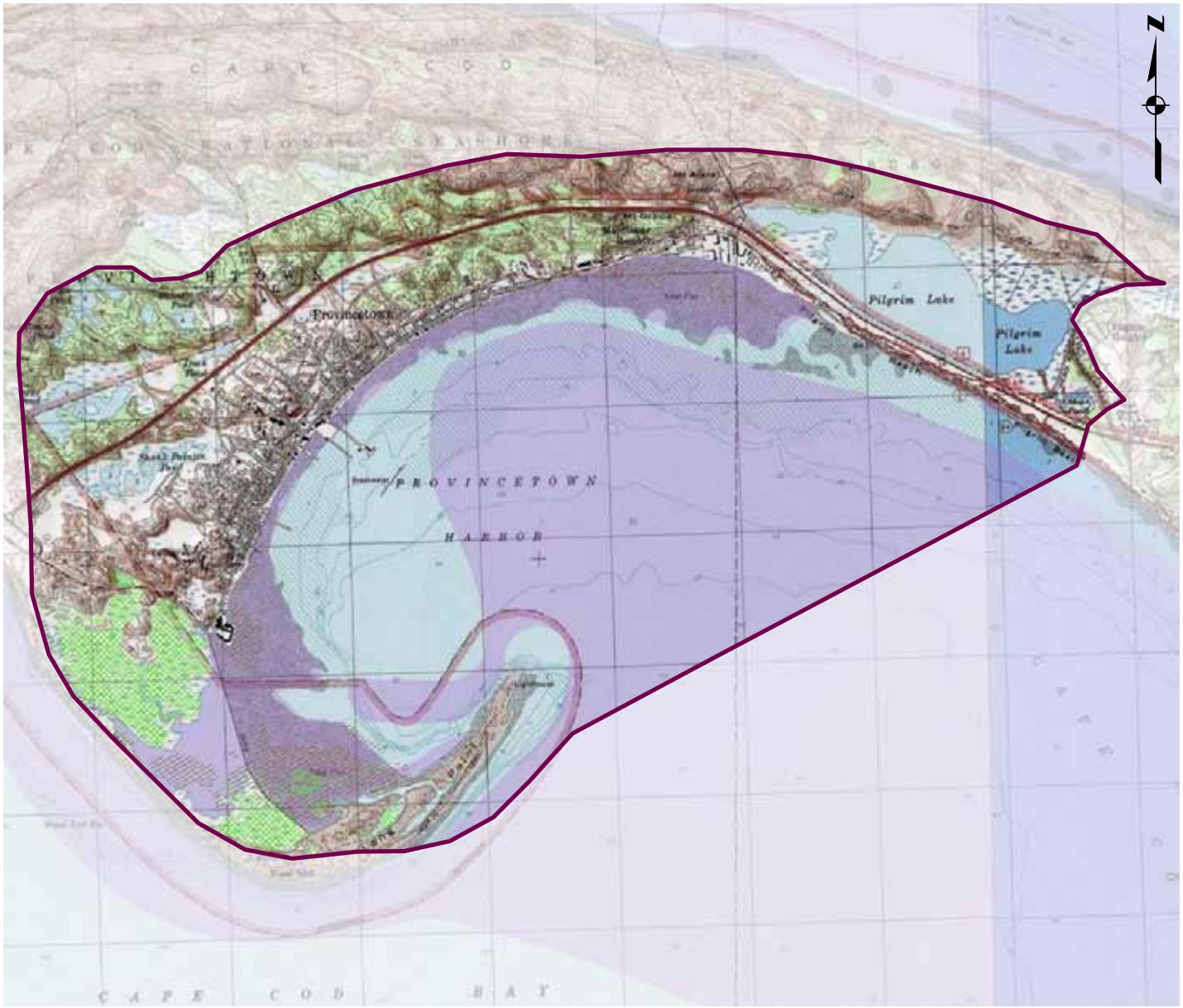

Legend

- Estuarine Watershed Boundary

Landward Boundary Considerations

- Chapter 91 Jurisdiction
- Contemporary High Water
- Marsh Boundary - landward
- Salt Water Wetland

Seaward Boundary Considerations

- Tidal Flats
- Seagrass bed (historic and current)
- Shellfish Suitability (multiple species)

Notes:
1. Seaward boundaries were first determined using Massachusetts 305(b) water body delineations and then expanded to include nearby tidal flats, shellfish habitat, and seagrass beds.
2. Landward boundaries were determined using pre-delineated watershed boundaries prepared by USGS. In some cases, the head of the tide along major tributaries was determined using maps of Chapter 91 Jurisdiction, as well as land use data showing the extent of salt marshes. Landward boundaries were then adjusted to remove major freshwater contributing watersheds.
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PROVINCETOWN HARBOR ESTUARINE WATERSHED

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APPENDIX C

MAPS, STRESSOR INDICATORS

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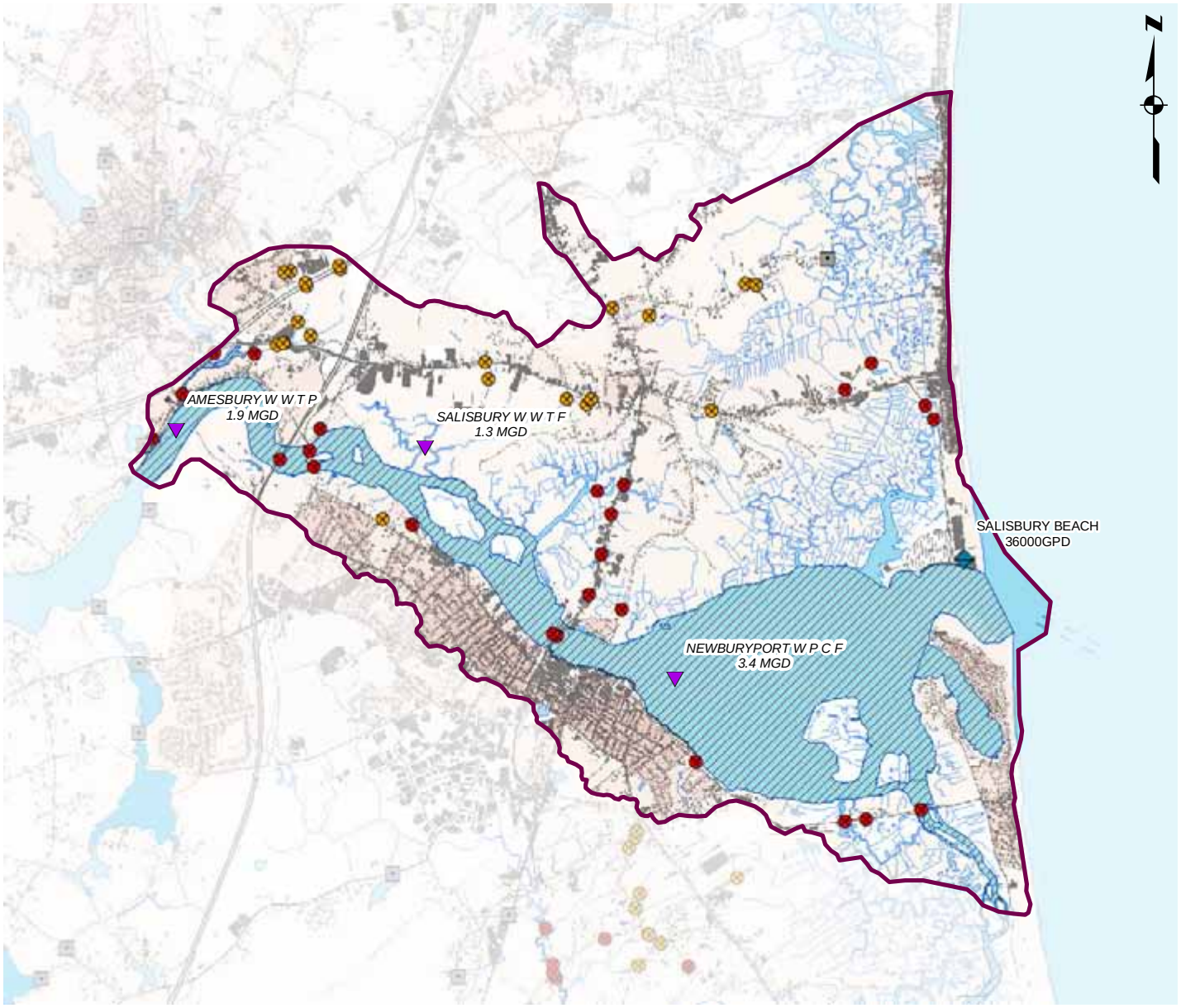

Legend

- Estuarine Watershed Boundary
- 303(d) Impairment for Nutrients (stream)
- 303(d) Impairment for Nutrients (water body)
- 303(d) Impairment for Bacteria (stream)
- 303(d) Impairment for Bacteria (water body)
- Wastewater Treatment Plant Outfall
- Groundwater Discharge Permit
- Impoundment with fish passage
- Impoundment
- Road Crossing
- Road Crossing within tidal area
- Impervious Surface

Population Density (persons/ac)

- 810
- 0

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MERRIMACK RIVER / BLACK ROCK CREEK ECOLOGICAL STRESSORS

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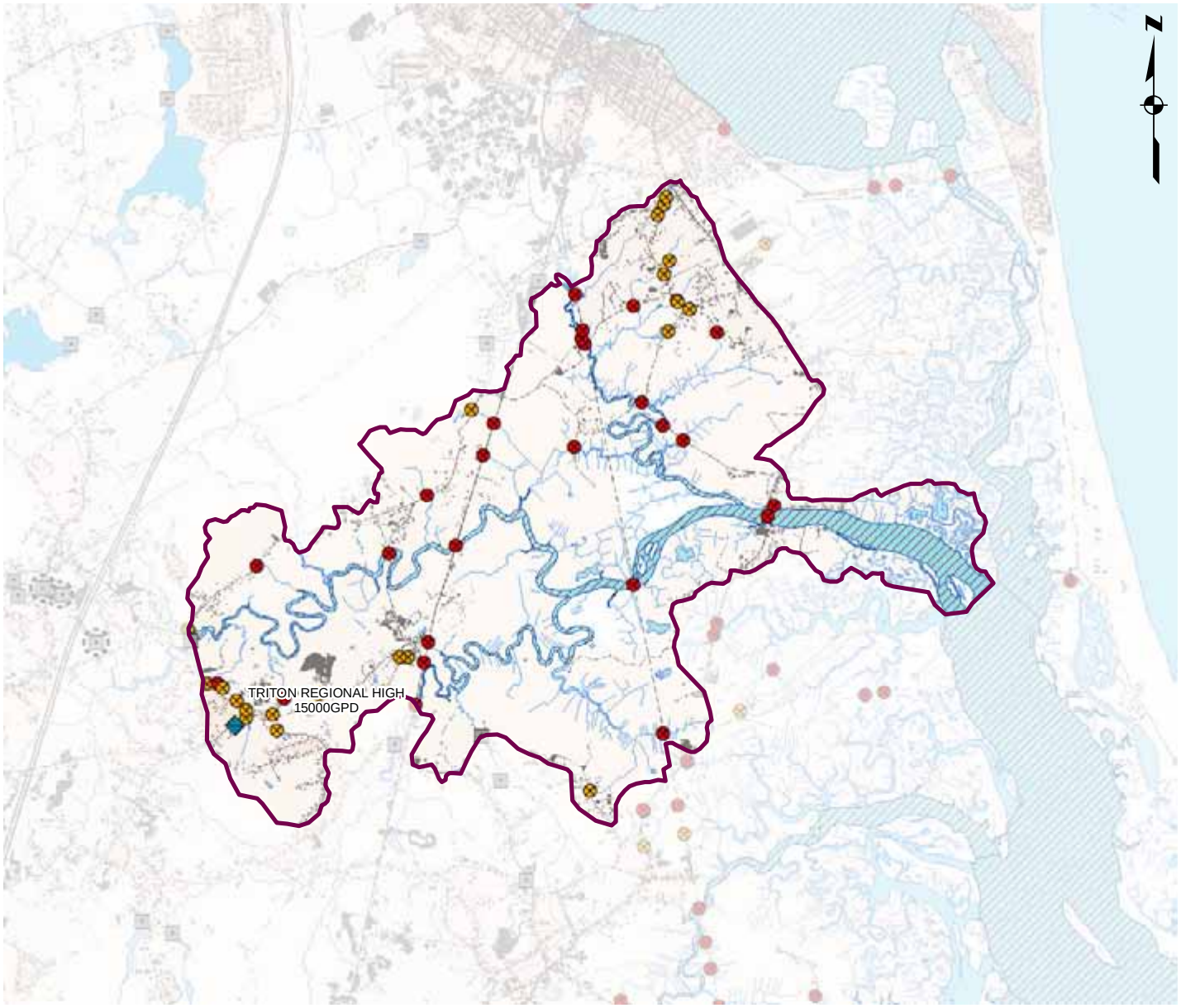

Legend

- Estuarine Watershed Boundary
- 303(d) Impairment for Nutrients (stream)
- 303(d) Impairment for Nutrients (water body)
- 303(d) Impairment for Bacteria (stream)
- 303(d) Impairment for Bacteria (water body)
- Wastewater Treatment Plant Outfall
- Groundwater Discharge Permit
- Impoundment with fish passage
- Impoundment
- Road Crossing
- Road Crossing within tidal area
- Impervious Surface

Population Density (persons/ac)

810

0

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PARKER RIVER
ECOLOGICAL STRESSORS

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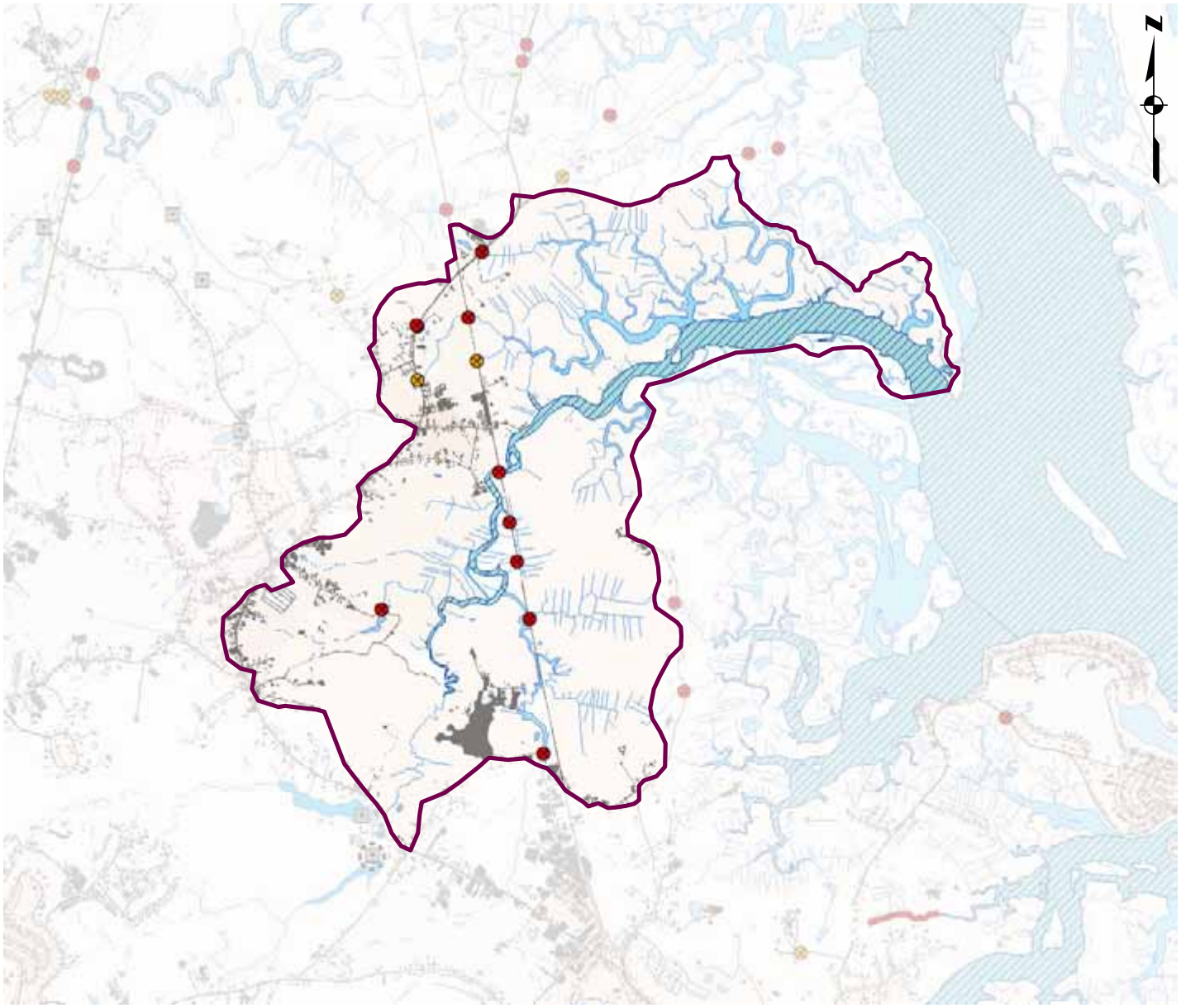

Legend

- Estuarine Watershed Boundary
- 303(d) Impairment for Nutrients (stream)
- 303(d) Impairment for Nutrients (water body)
- 303(d) Impairment for Bacteria (stream)
- 303(d) Impairment for Bacteria (water body)
- Wastewater Treatment Plant Outfall
- Groundwater Discharge Permit
- Impoundment with fish passage
- Impoundment
- Road Crossing
- Road Crossing within tidal area
- Impervious Surface

Population Density (persons/ac)

810

0

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ROWLEY RIVER ECOLOGICAL STRESSORS

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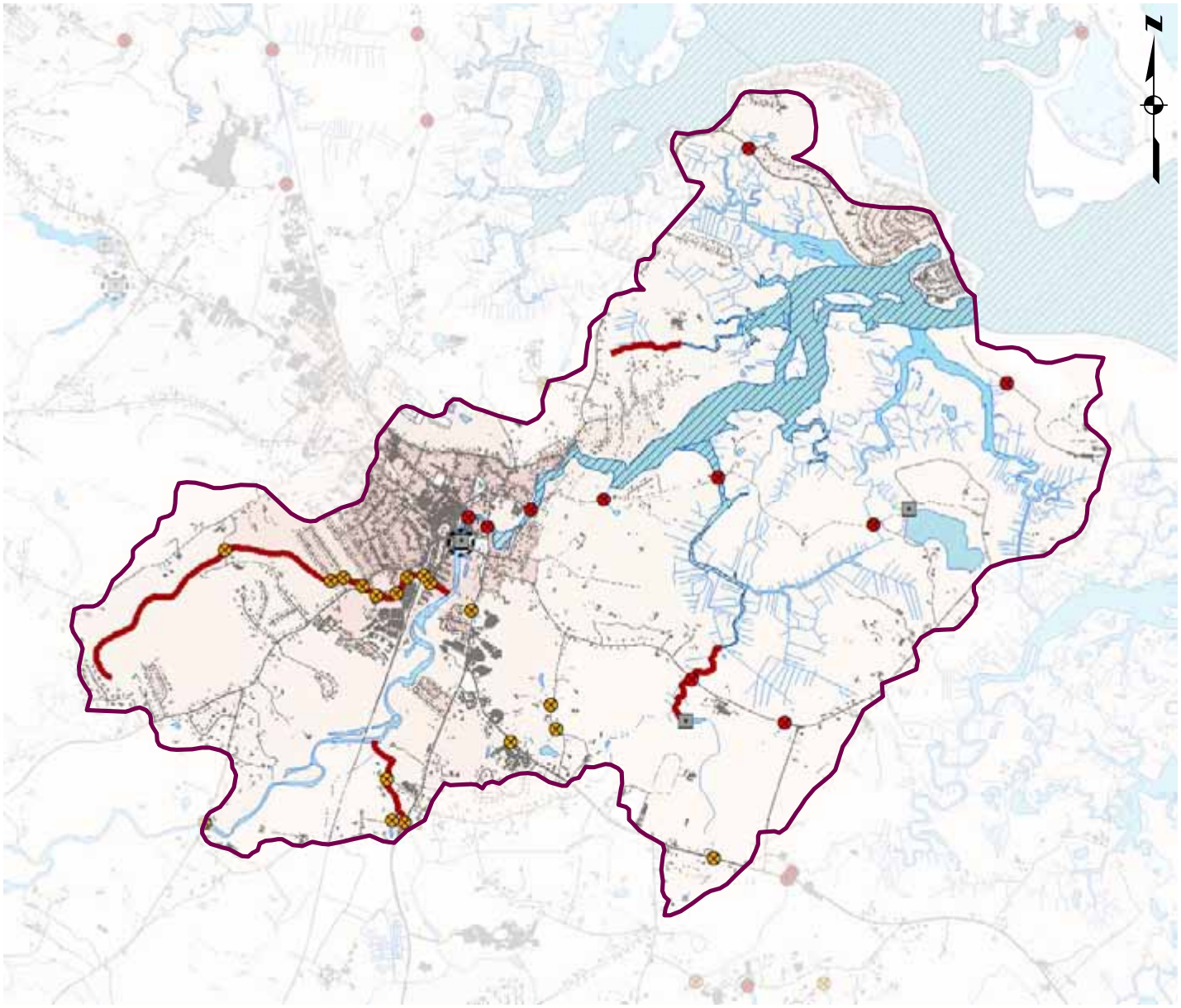

Legend

- Estuarine Watershed Boundary
- 303(d) Impairment for Nutrients (stream)
- 303(d) Impairment for Nutrients (water body)
- 303(d) Impairment for Bacteria (stream)
- 303(d) Impairment for Bacteria (water body)
- Wastewater Treatment Plant Outfall
- Groundwater Discharge Permit
- Impoundment with fish passage
- Impoundment
- Road Crossing
- Road Crossing within tidal area
- Impervious Surface

Population Density (persons/ac)

- 810
- 0

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IPSWICH RIVER ECOLOGICAL STRESSORS

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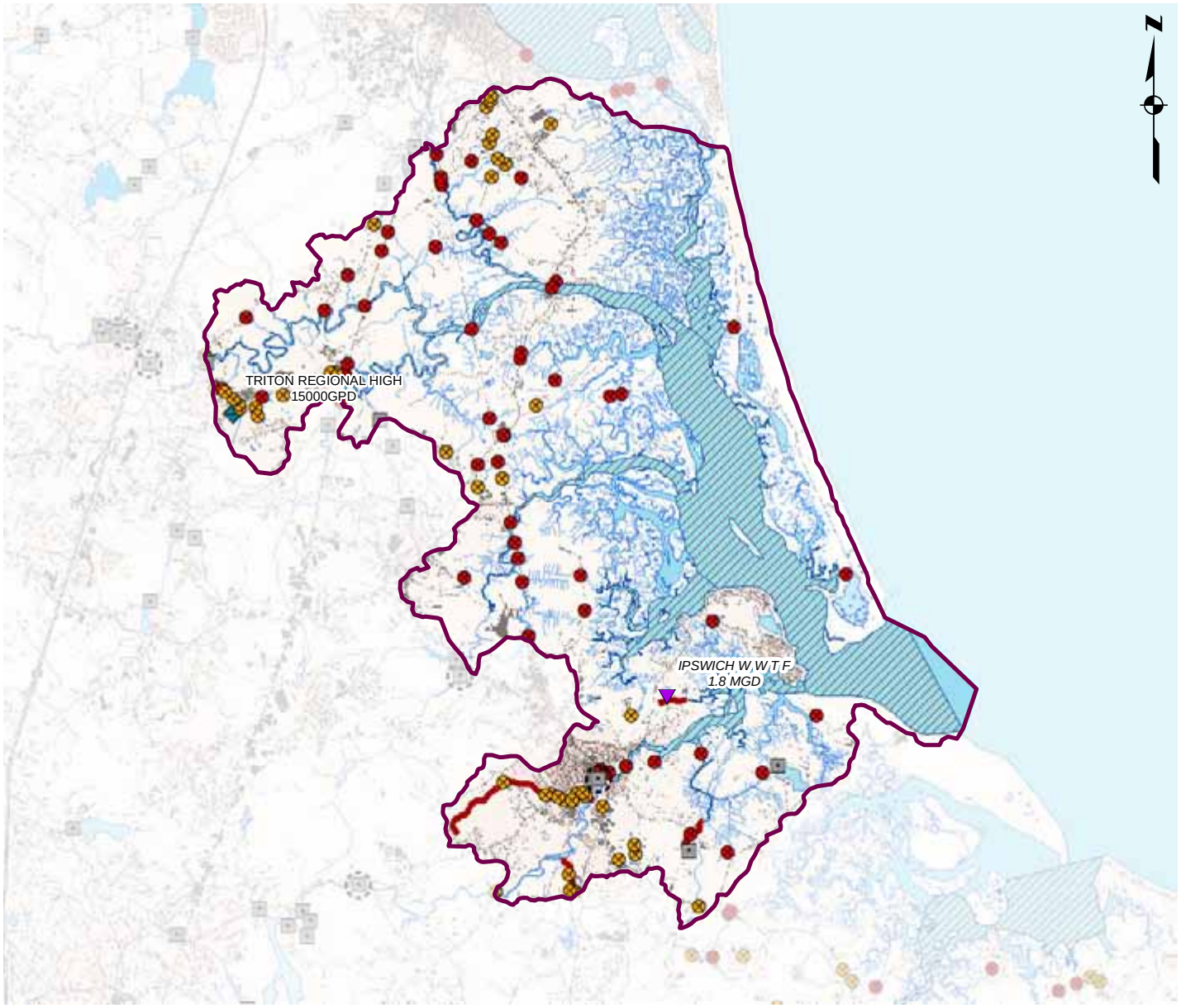

Legend

- Estuarine Watershed Boundary
- 303(d) Impairment for Nutrients (stream)
- 303(d) Impairment for Nutrients (water body)
- 303(d) Impairment for Bacteria (stream)
- 303(d) Impairment for Bacteria (water body)
- Wastewater Treatment Plant Outfall
- Groundwater Discharge Permit
- Impoundment with fish passage
- Impoundment
- Road Crossing
- Road Crossing within tidal area
- Impervious Surface

Population Density (persons/ac)

810

0

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PLUM ISLAND SOUND ECOLOGICAL STRESSORS

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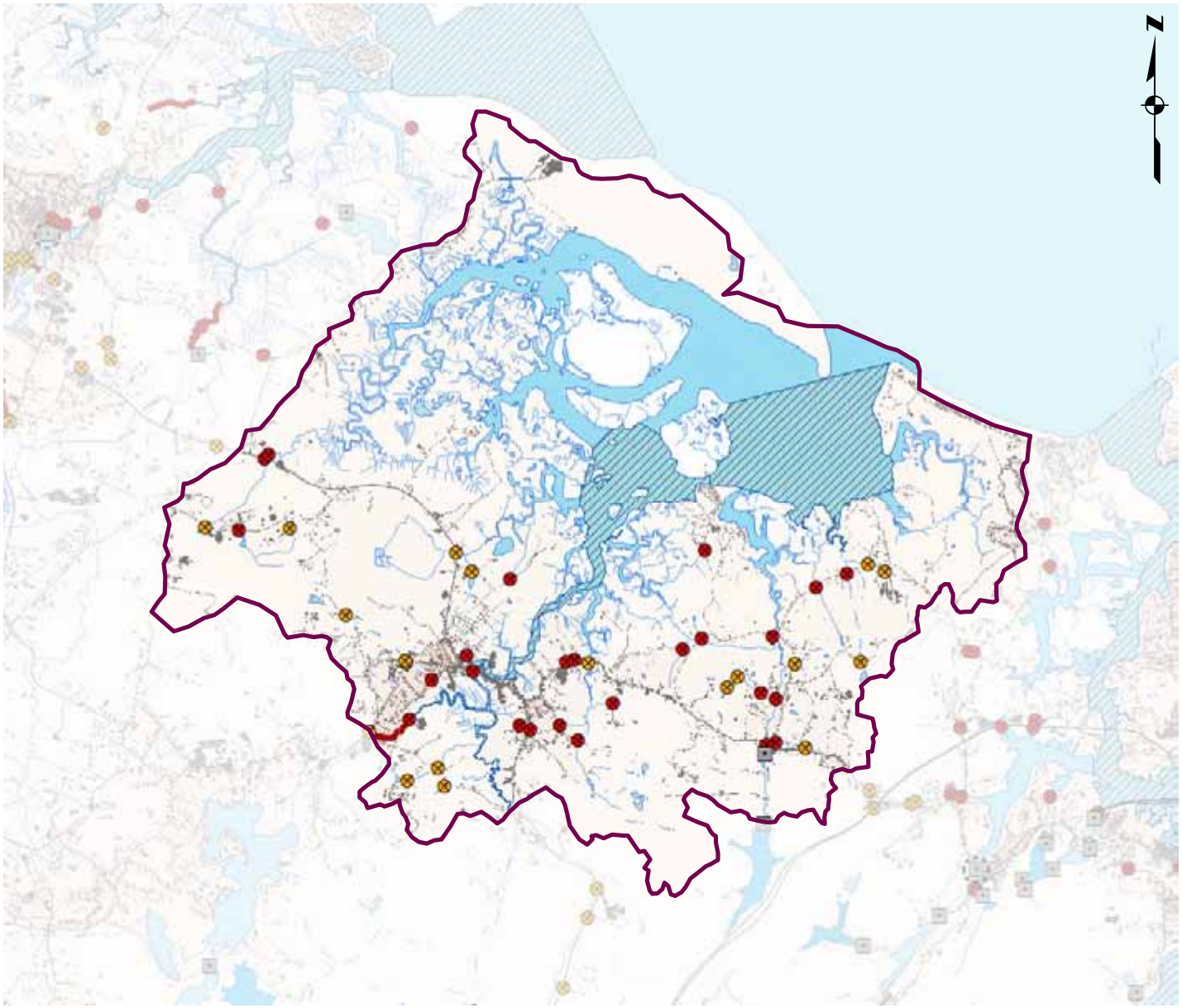

Legend

- Estuarine Watershed Boundary
- 303(d) Impairment for Nutrients (stream)
- 303(d) Impairment for Nutrients (water body)
- 303(d) Impairment for Bacteria (stream)
- 303(d) Impairment for Bacteria (water body)
- Wastewater Treatment Plant Outfall
- Groundwater Discharge Permit
- Impoundment with fish passage
- Impoundment
- Road Crossing
- Road Crossing within tidal area
- Impervious Surface

Population Density (persons/ac)

810

0

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ESSEX RIVER / ESSEX BAY
ECOLOGICAL STRESSORS

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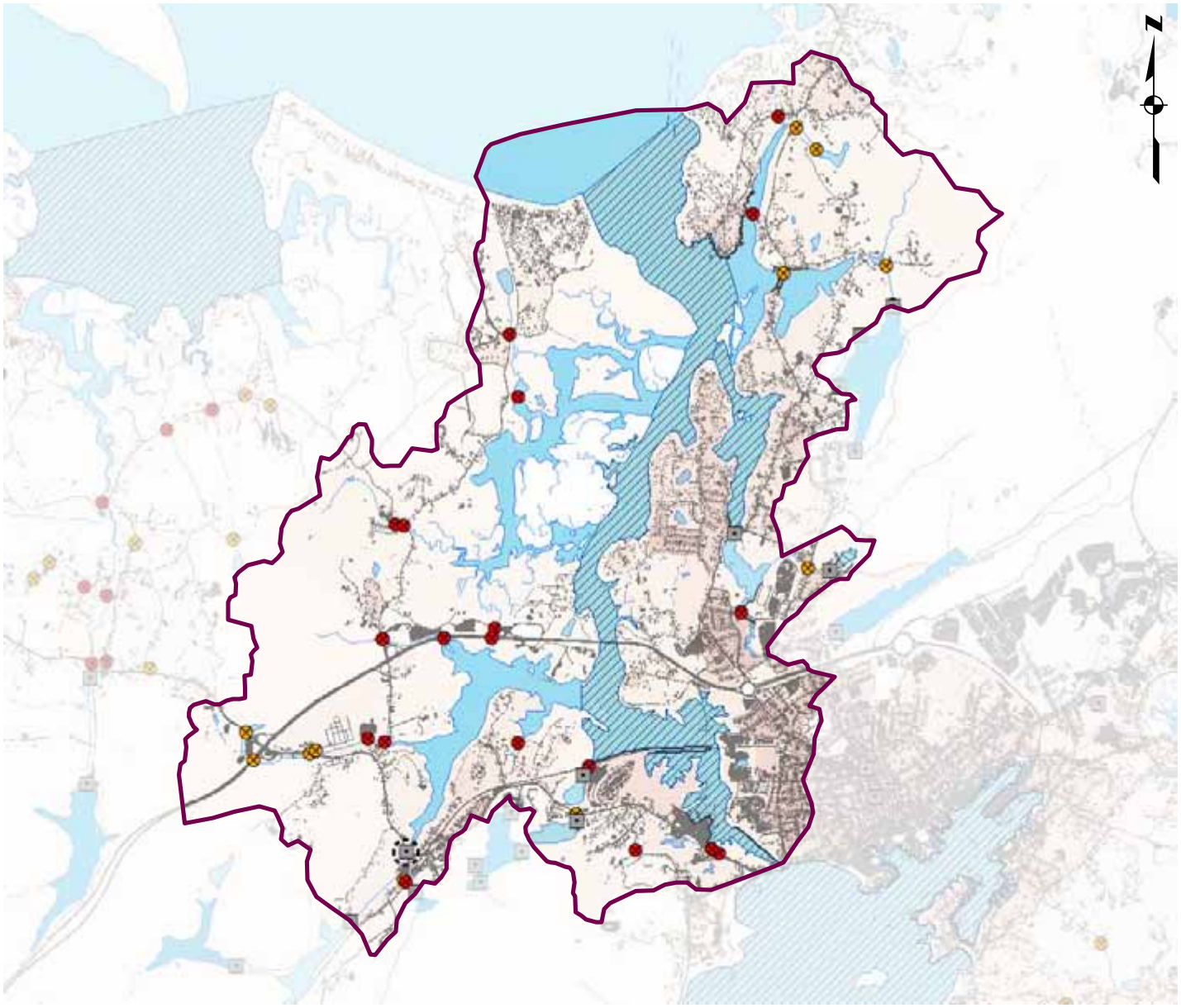

Legend

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- 303(d) Impairment for Nutrients (stream)
- 303(d) Impairment for Nutrients (water body)
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- 303(d) Impairment for Bacteria (water body)
- Wastewater Treatment Plant Outfall
- Groundwater Discharge Permit
- Impoundment with fish passage
- Impoundment
- Road Crossing
- Road Crossing within tidal area
- Impervious Surface

Population Density (persons/ac)

810

0

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ANNISQUAM RIVER ECOLOGICAL STRESSORS

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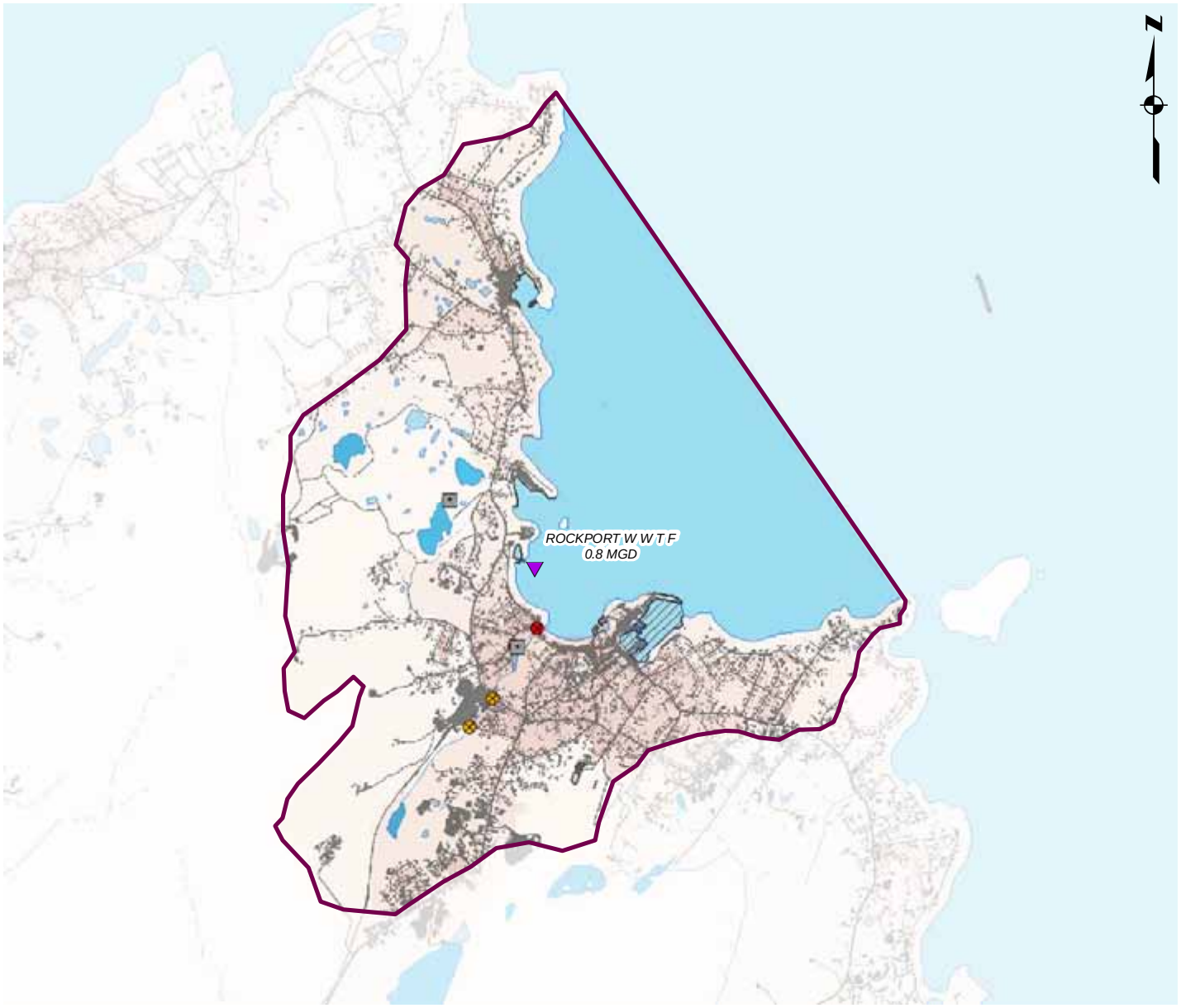

Legend

- Estuarine Watershed Boundary
- 303(d) Impairment for Nutrients (stream)
- 303(d) Impairment for Nutrients (water body)
- 303(d) Impairment for Bacteria (stream)
- 303(d) Impairment for Bacteria (water body)
- Wastewater Treatment Plant Outfall
- Groundwater Discharge Permit
- Impoundment with fish passage
- Impoundment
- Road Crossing
- Road Crossing within tidal area
- Impervious Surface

Population Density (persons/ac)

810

0

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ROCKPORT HARBOR (SANDY BAY) ECOLOGICAL STRESSORS

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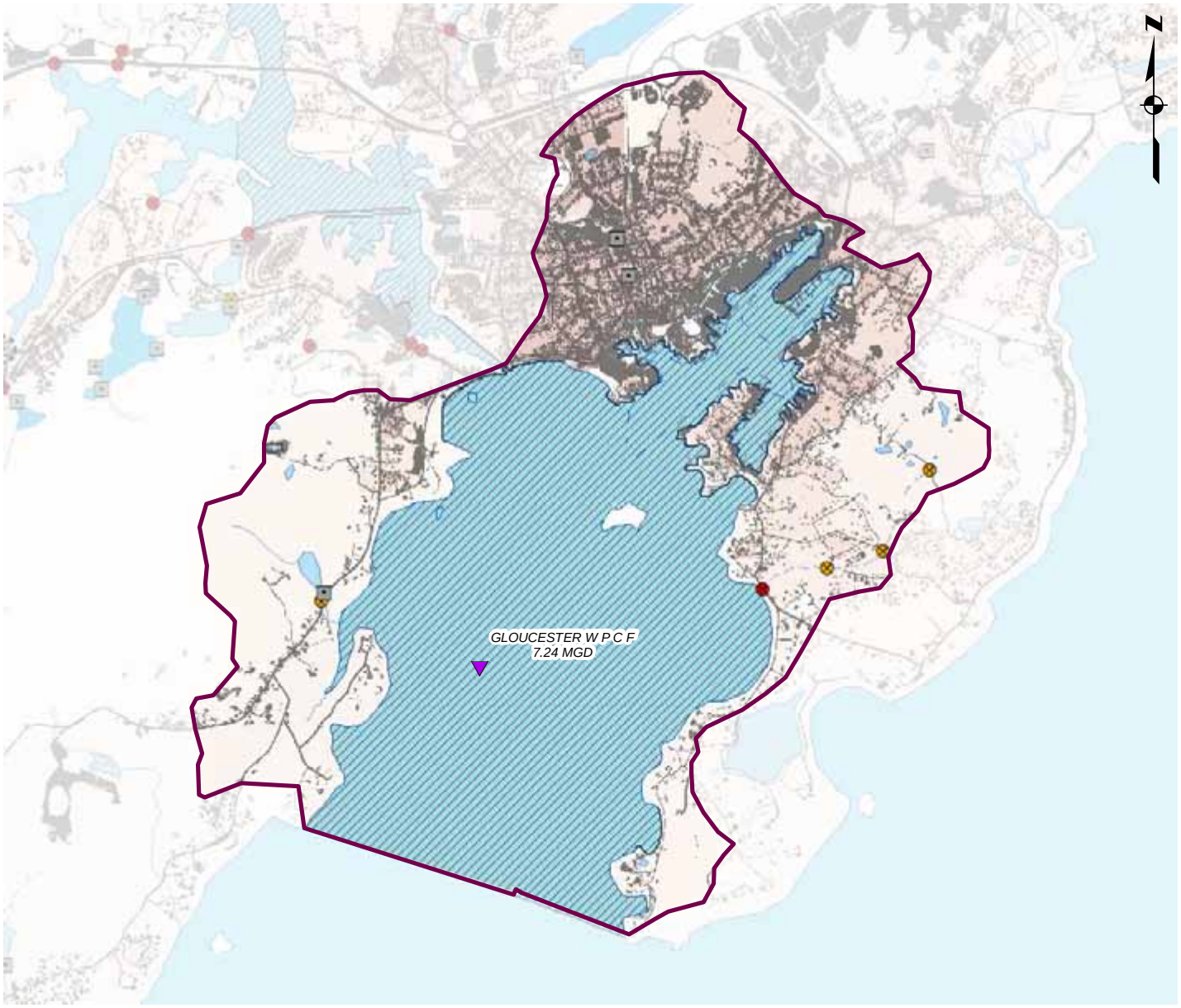

Legend

- Estuarine Watershed Boundary
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- 303(d) Impairment for Nutrients (water body)
- 303(d) Impairment for Bacteria (stream)
- 303(d) Impairment for Bacteria (water body)
- Wastewater Treatment Plant Outfall
- Groundwater Discharge Permit
- Impoundment with fish passage
- Impoundment
- Road Crossing
- Road Crossing within tidal area
- Impervious Surface

Population Density (persons/ac)

810

0

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GLOUCESTER HARBOR ECOLOGICAL STRESSORS

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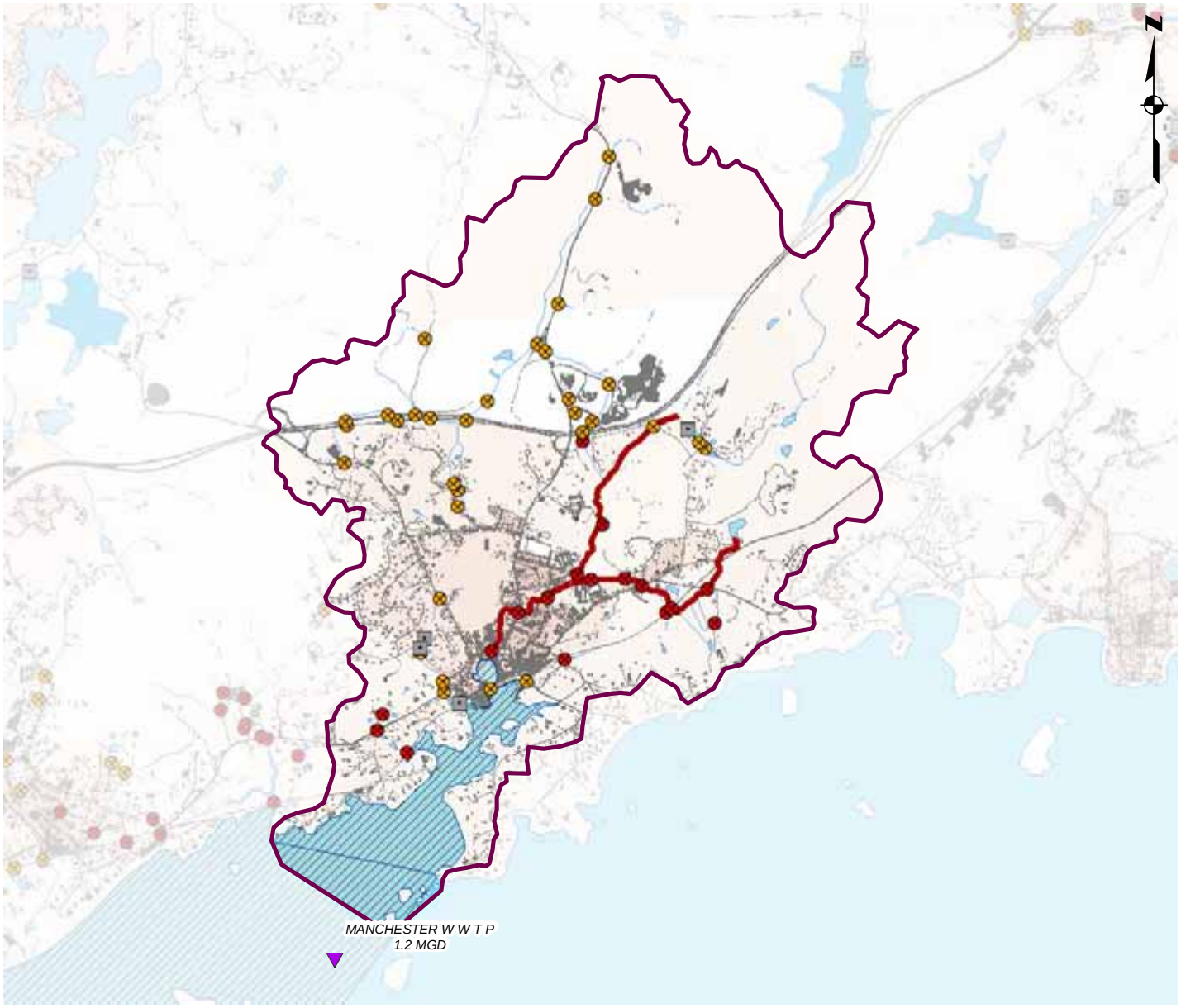

Legend

- Estuarine Watershed Boundary
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- 303(d) Impairment for Nutrients (water body)
- 303(d) Impairment for Bacteria (stream)
- 303(d) Impairment for Bacteria (water body)
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- Groundwater Discharge Permit
- Impoundment with fish passage
- Impoundment
- Road Crossing
- Road Crossing within tidal area
- Impervious Surface

Population Density (persons/ac)

810

0

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MANCHESTER HARBOR ECOLOGICAL STRESSORS

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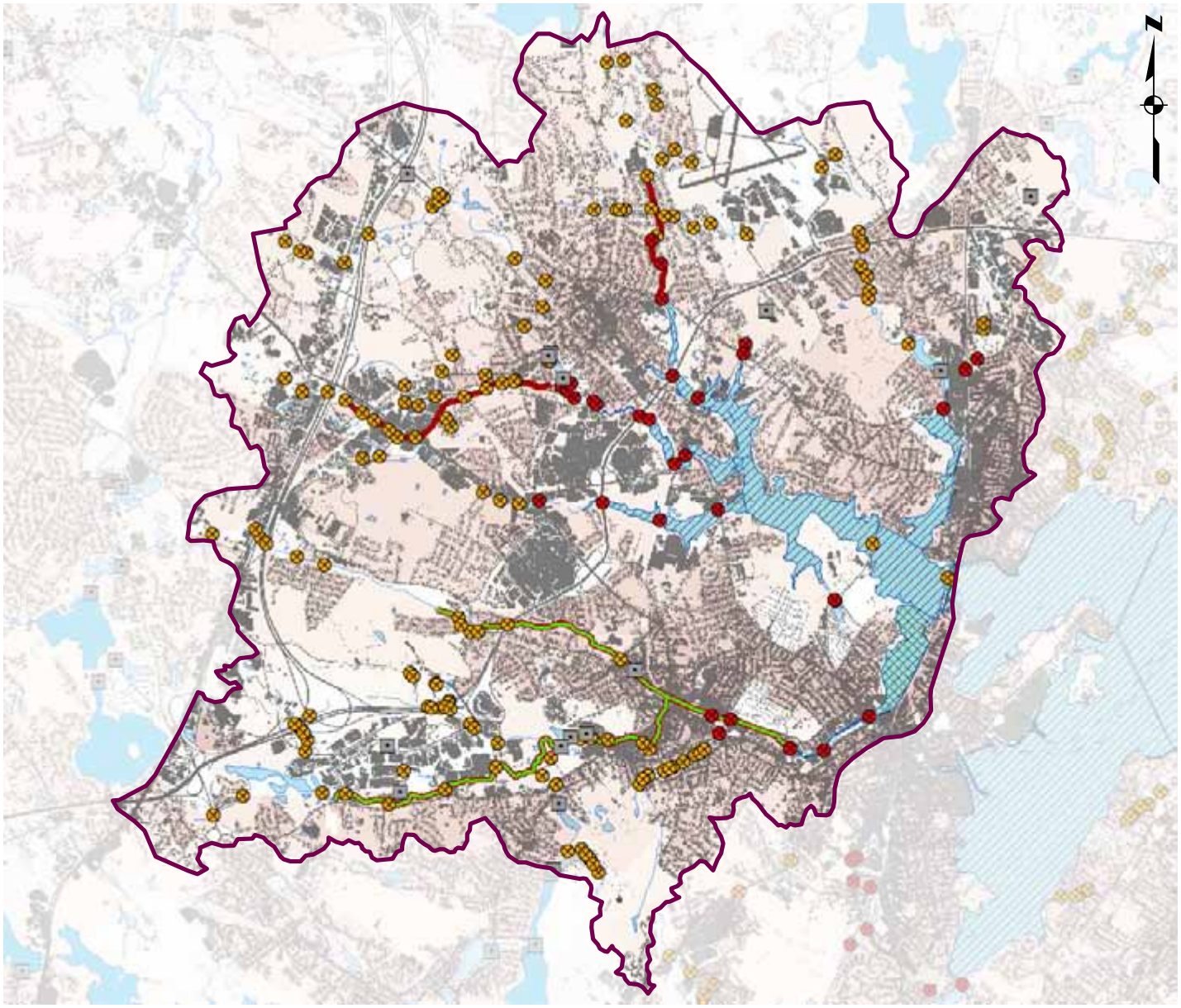

Legend

- Estuarine Watershed Boundary
- 303(d) Impairment for Nutrients (stream)
- 303(d) Impairment for Nutrients (water body)
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- 303(d) Impairment for Bacteria (water body)
- Wastewater Treatment Plant Outfall
- Groundwater Discharge Permit
- Impoundment with fish passage
- Impoundment
- Road Crossing
- Road Crossing within tidal area
- Impervious Surface

Population Density (persons/ac)

- 810
- 0

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DANVERS RIVER
ECOLOGICAL STRESSORS

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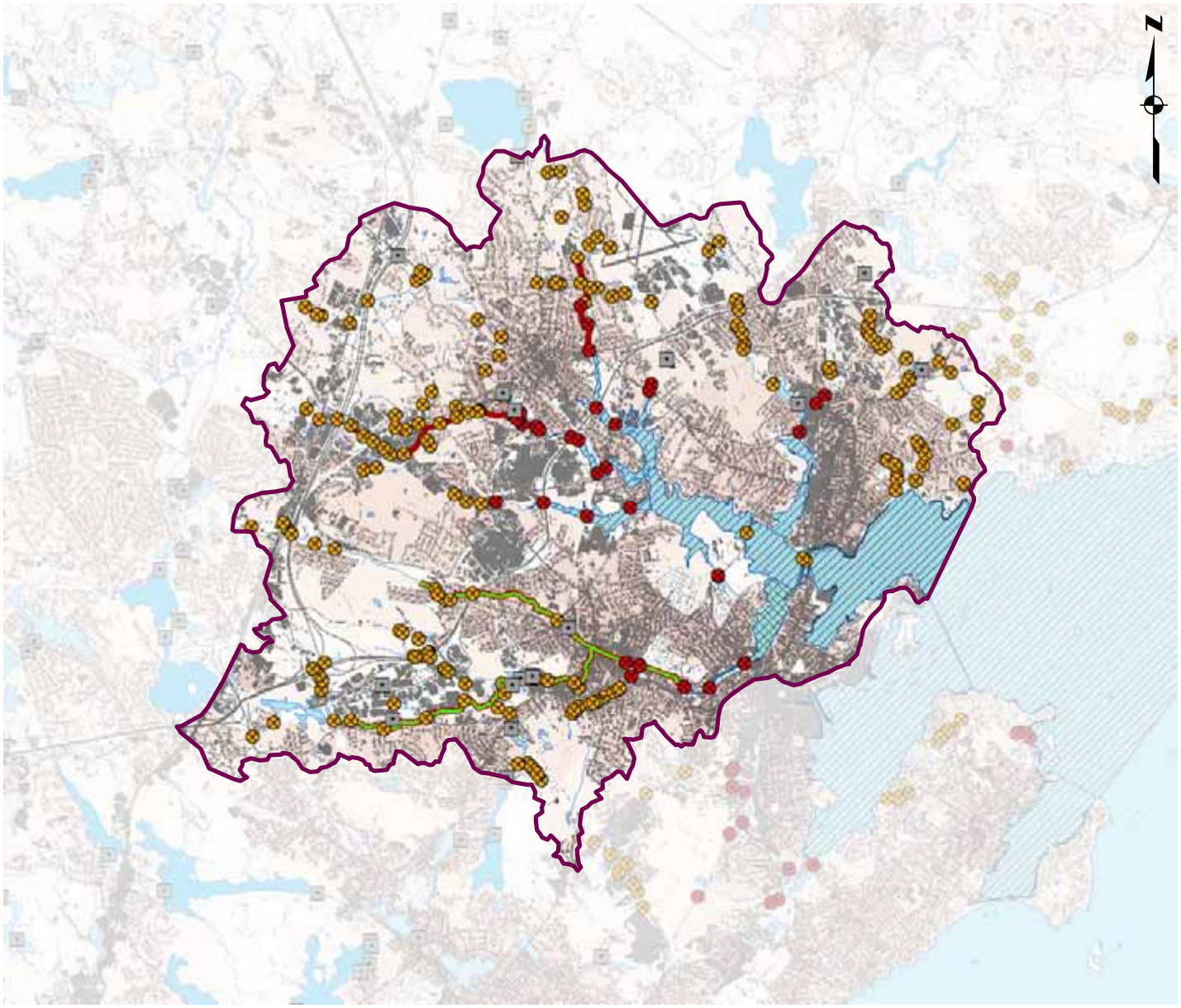

Legend

- Estuarine Watershed Boundary
- 303(d) Impairment for Nutrients (stream)
- 303(d) Impairment for Nutrients (water body)
- 303(d) Impairment for Bacteria (stream)
- 303(d) Impairment for Bacteria (water body)
- Wastewater Treatment Plant Outfall
- Groundwater Discharge Permit
- Impoundment with fish passage
- Impoundment
- Road Crossing
- Road Crossing within tidal area
- Impervious Surface

Population Density (persons/ac)

810

0

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BEVERLY HARBOR ECOLOGICAL STRESSORS

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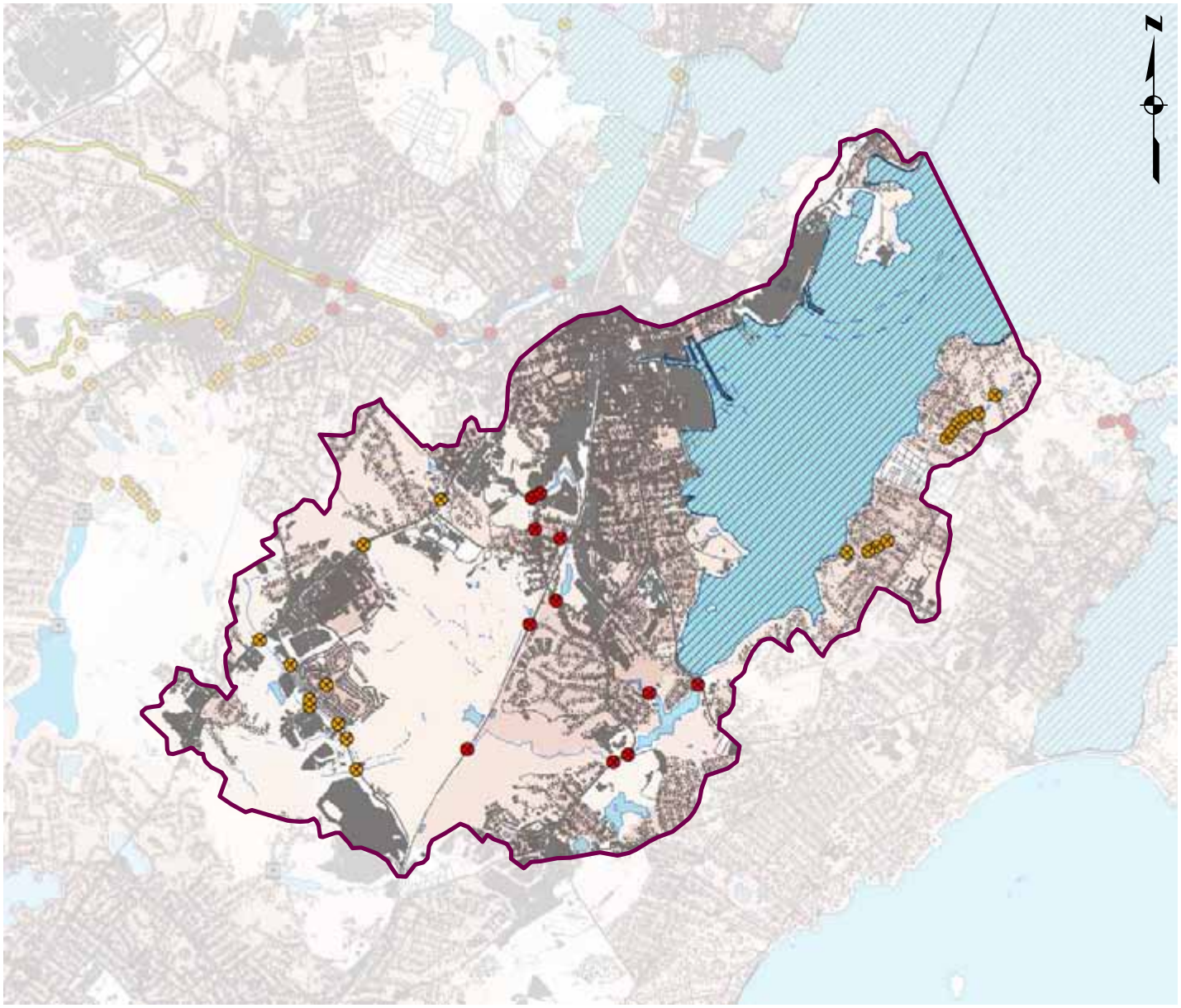

Legend

- Estuarine Watershed Boundary
- 303(d) Impairment for Nutrients (stream)
- 303(d) Impairment for Nutrients (water body)
- 303(d) Impairment for Bacteria (stream)
- 303(d) Impairment for Bacteria (water body)
- Wastewater Treatment Plant Outfall
- Groundwater Discharge Permit
- Impoundment with fish passage
- Impoundment
- Road Crossing
- Road Crossing within tidal area
- Impervious Surface

Population Density (persons/ac)

- 810
- 0

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FOREST RIVER / SALEM HARBOR ECOLOGICAL STRESSORS

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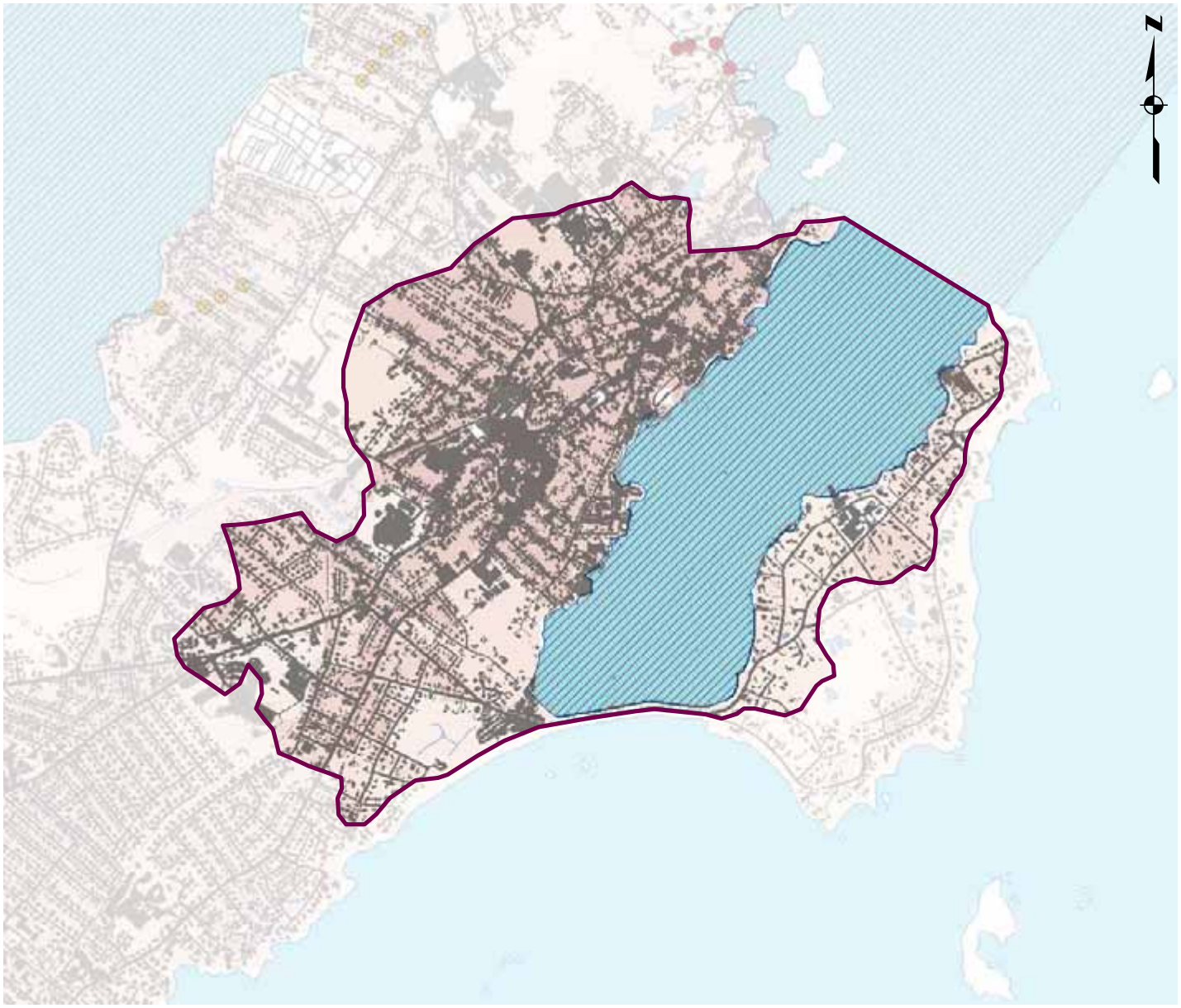

Legend

- Estuarine Watershed Boundary
- 303(d) Impairment for Nutrients (stream)
- 303(d) Impairment for Nutrients (water body)
- 303(d) Impairment for Bacteria (stream)
- 303(d) Impairment for Bacteria (water body)
- Wastewater Treatment Plant Outfall
- Groundwater Discharge Permit
- Impoundment with fish passage
- Impoundment
- Road Crossing
- Road Crossing within tidal area
- Impervious Surface

Population Density (persons/ac)

810

0

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MARBLEHEAD HARBOR ECOLOGICAL STRESSORS

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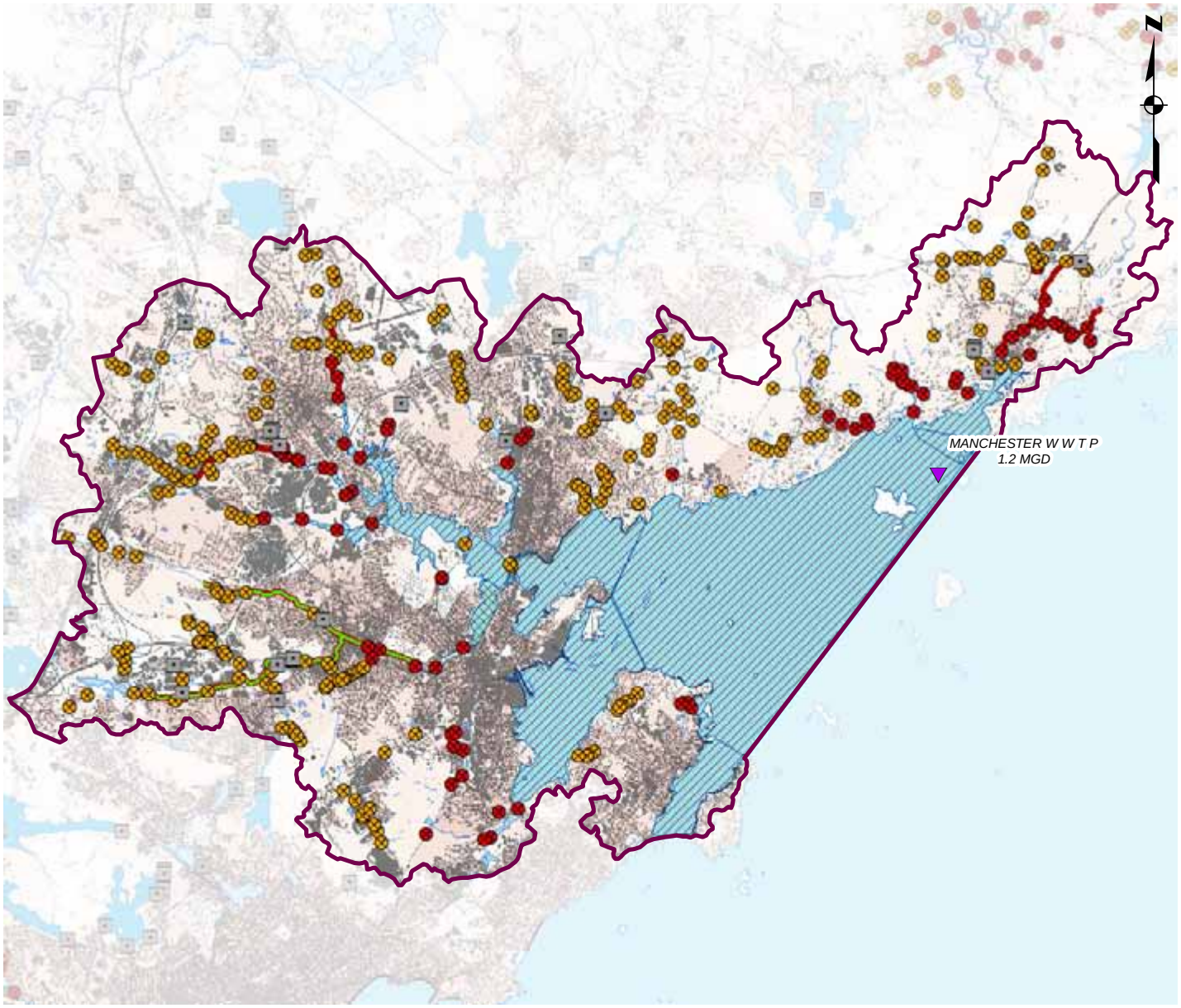

Legend

- Estuarine Watershed Boundary
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- 303(d) Impairment for Nutrients (water body)
- 303(d) Impairment for Bacteria (stream)
- 303(d) Impairment for Bacteria (water body)
- Wastewater Treatment Plant Outfall
- Groundwater Discharge Permit
- Impoundment with fish passage
- Impoundment
- Road Crossing
- Road Crossing within tidal area
- Impervious Surface

Population Density (persons/ac)

810

0

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SALEM SOUND
ECOLOGICAL STRESSORS

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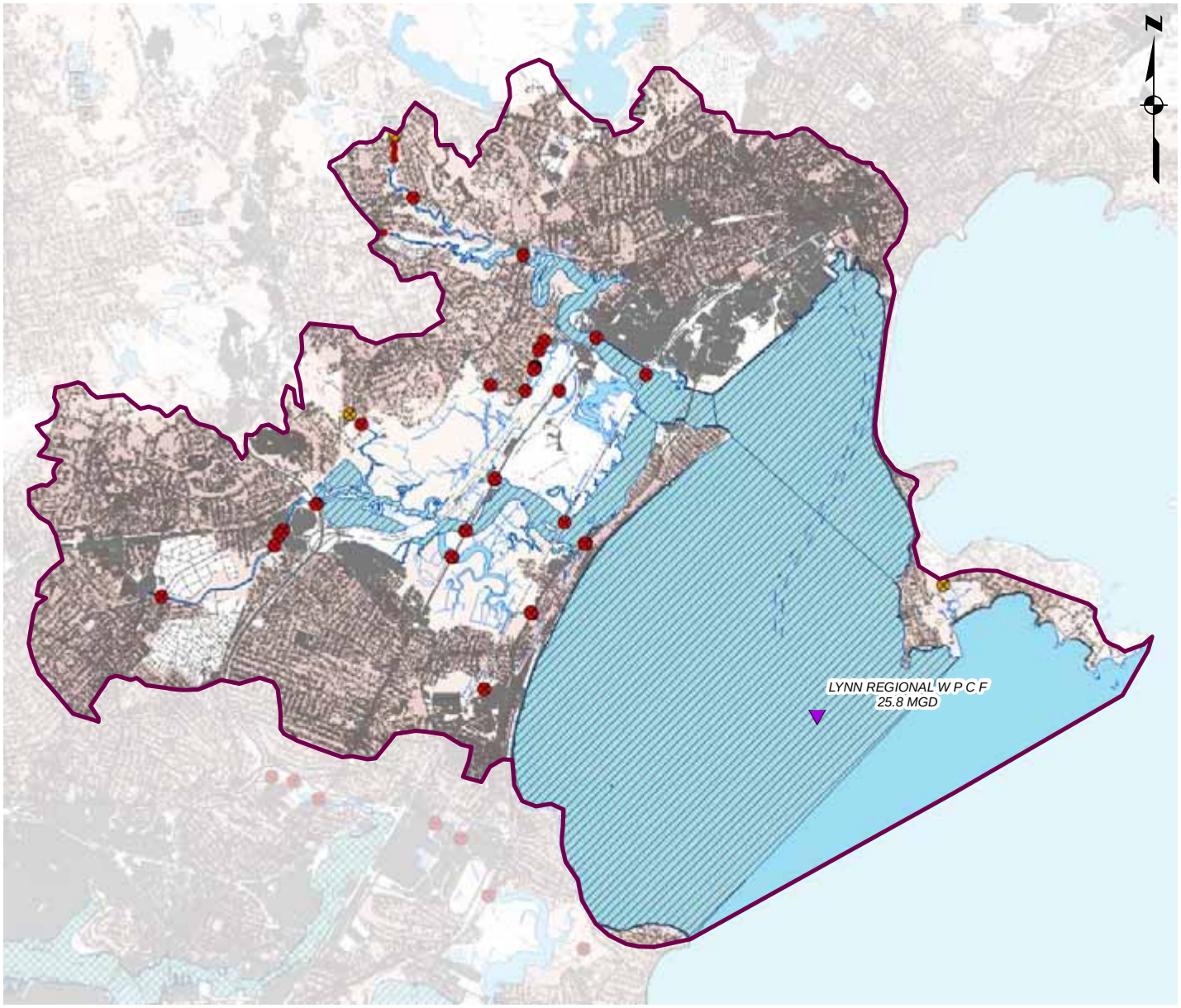

Legend

- Estuarine Watershed Boundary
- 303(d) Impairment for Nutrients (stream)
- 303(d) Impairment for Nutrients (water body)
- 303(d) Impairment for Bacteria (stream)
- 303(d) Impairment for Bacteria (water body)
- Wastewater Treatment Plant Outfall
- Groundwater Discharge Permit
- Impoundment with fish passage
- Impoundment
- Road Crossing
- Road Crossing within tidal area
- Impervious Surface

Population Density (persons/ac)

810

0

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SAUGUS RIVER / PINES RIVER / LYNN HARBOR ECOLOGICAL STRESSORS

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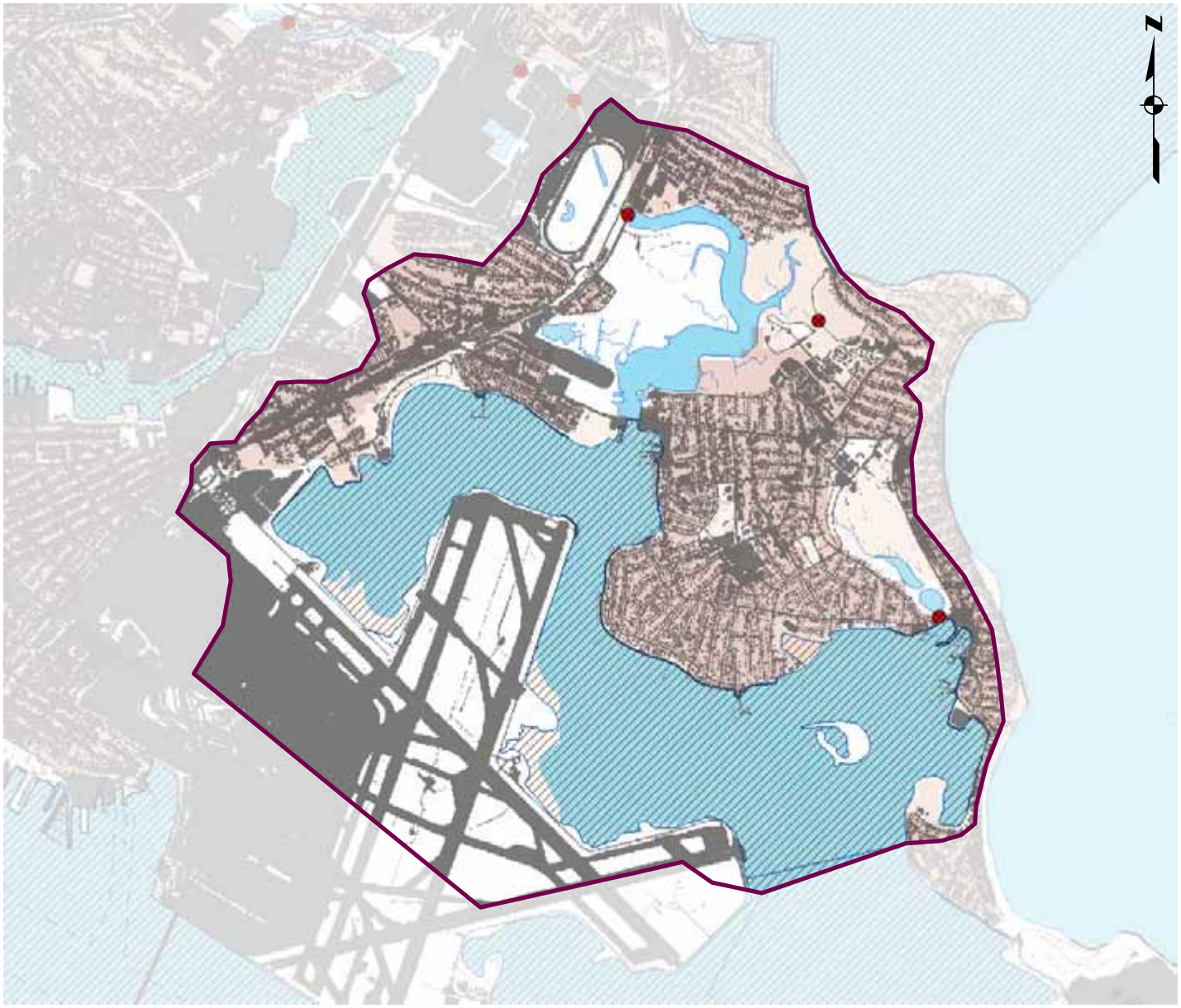

Legend

- Estuarine Watershed Boundary
- 303(d) Impairment for Nutrients (stream)
- 303(d) Impairment for Nutrients (water body)
- 303(d) Impairment for Bacteria (stream)
- 303(d) Impairment for Bacteria (water body)
- Wastewater Treatment Plant Outfall
- Groundwater Discharge Permit
- Impoundment with fish passage
- Impoundment
- Road Crossing
- Road Crossing within tidal area
- Impervious Surface

Population Density (persons/ac)

- 810
- 0

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BELLE ISLE CREEK / WINTHROP BAY
ECOLOGICAL STRESSORS

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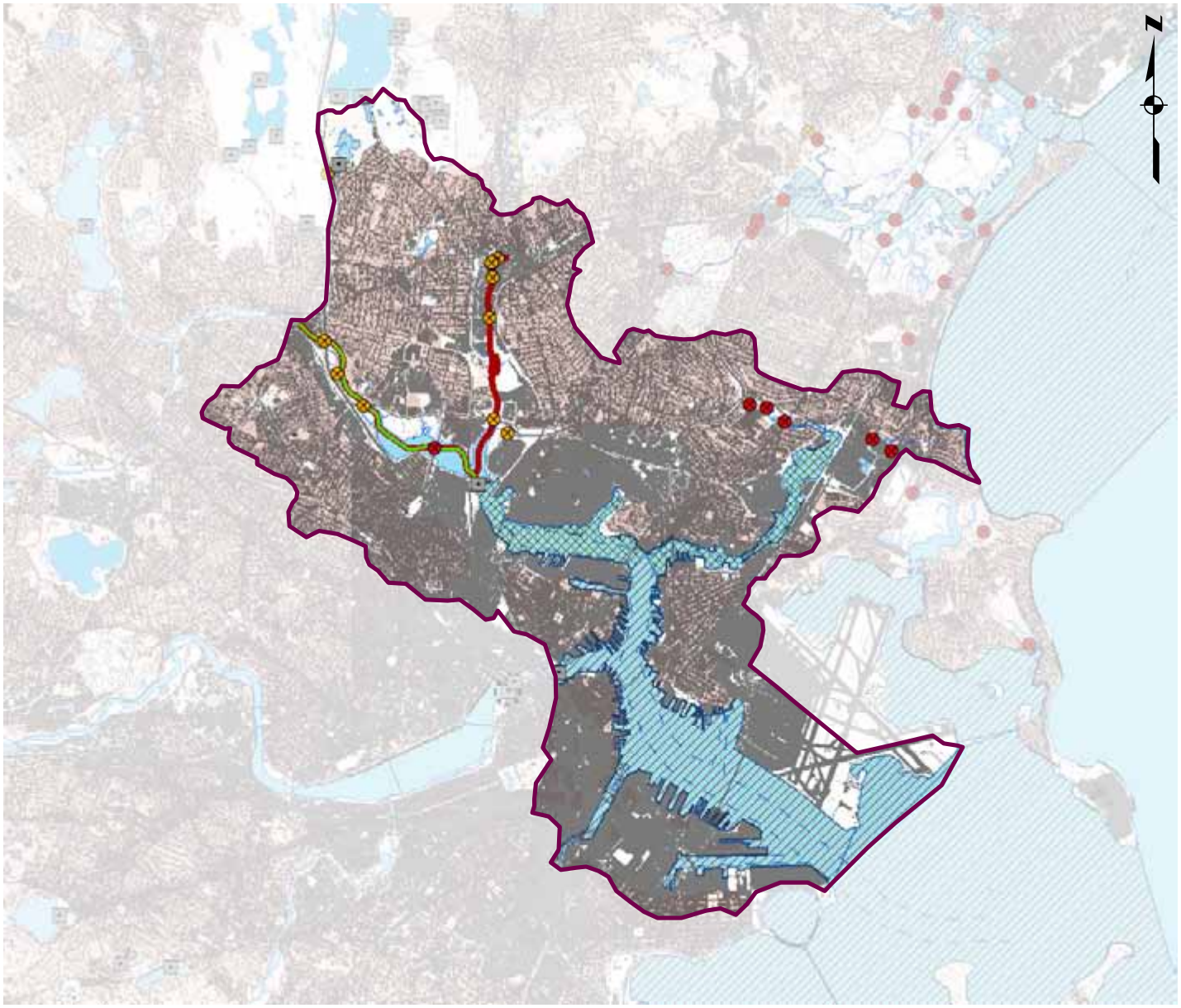

Legend

- Estuarine Watershed Boundary
- 303(d) Impairment for Nutrients (stream)
- 303(d) Impairment for Nutrients (water body)
- 303(d) Impairment for Bacteria (stream)
- 303(d) Impairment for Bacteria (water body)
- Wastewater Treatment Plant Outfall
- Groundwater Discharge Permit
- Impoundment with fish passage
- Impoundment
- Road Crossing
- Road Crossing within tidal area
- Impervious Surface

Population Density (persons/ac)

810

0

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CHELSEA CREEK / MYSTIC RIVER / CHARLES RIVER ECOLOGICAL STRESSORS

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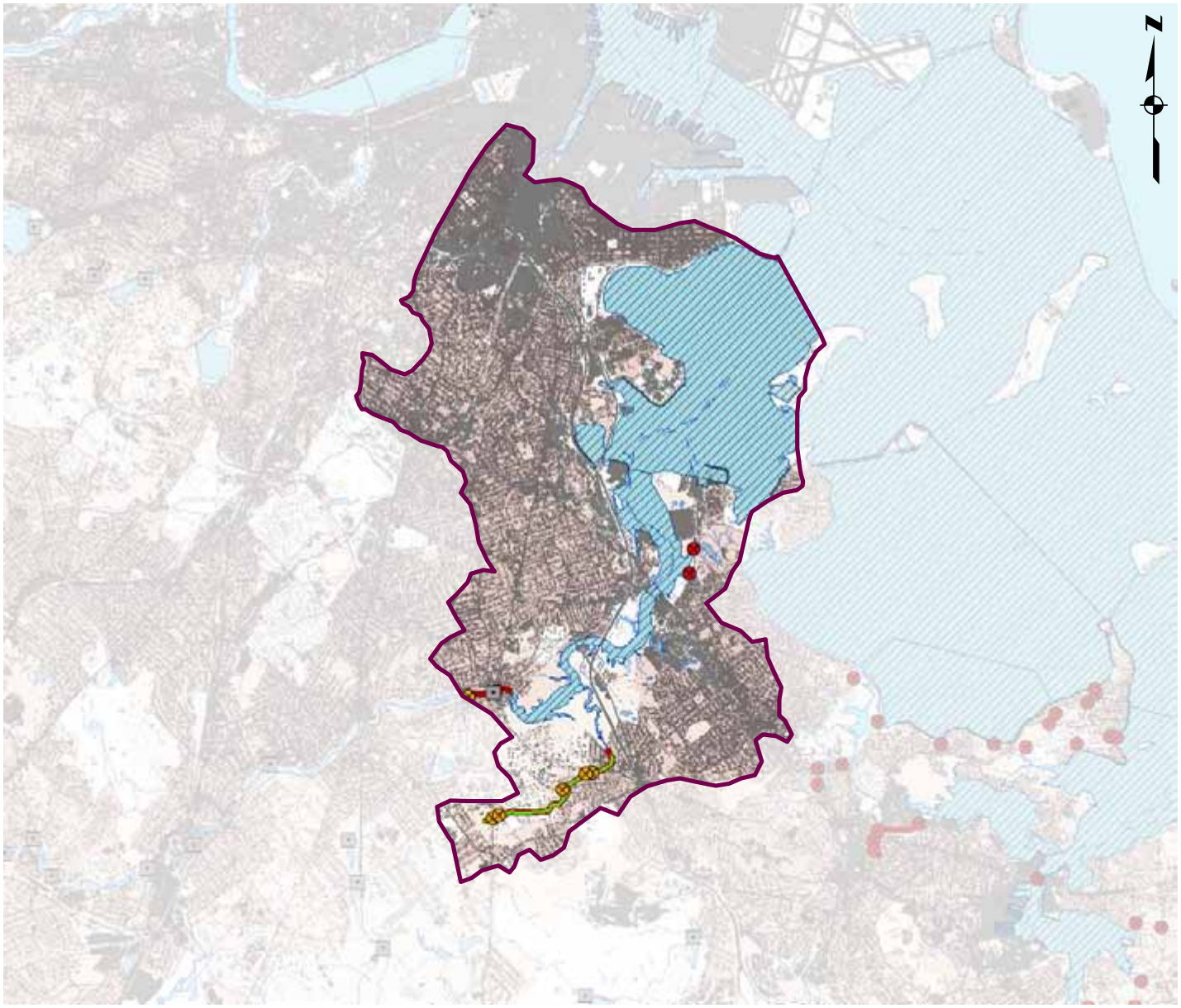

Legend

- Estuarine Watershed Boundary
- 303(d) Impairment for Nutrients (stream)
- 303(d) Impairment for Nutrients (water body)
- 303(d) Impairment for Bacteria (stream)
- 303(d) Impairment for Bacteria (water body)
- Wastewater Treatment Plant Outfall
- Groundwater Discharge Permit
- Impoundment with fish passage
- Impoundment
- Road Crossing
- Road Crossing within tidal area
- Impervious Surface

Population Density (persons/ac)

810

0

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NEPONSET RIVER / DORCHESTER BAY ECOLOGICAL STRESSORS

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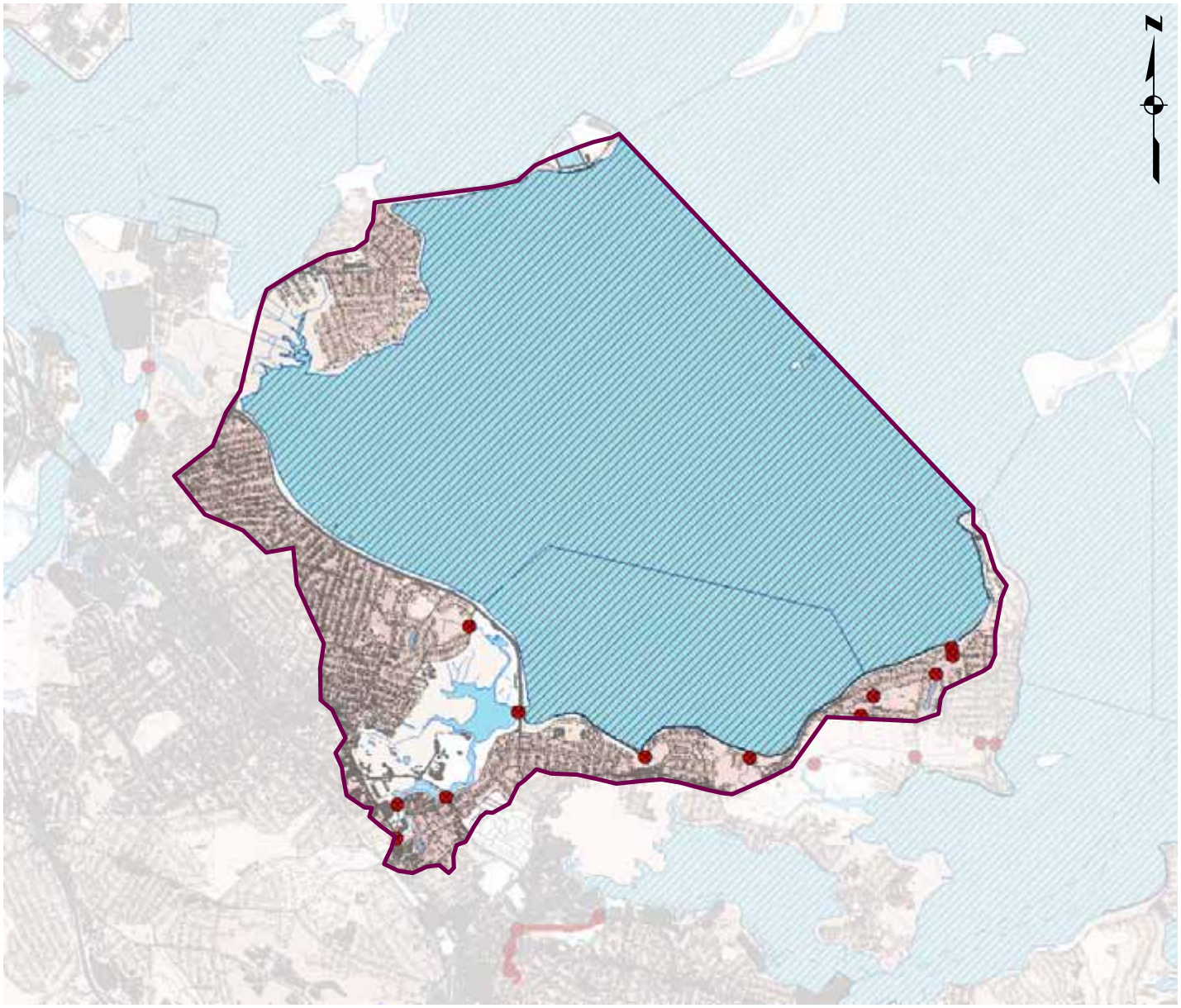

Legend

- Estuarine Watershed Boundary
- 303(d) Impairment for Nutrients (stream)
- 303(d) Impairment for Nutrients (water body)
- 303(d) Impairment for Bacteria (stream)
- 303(d) Impairment for Bacteria (water body)
- Wastewater Treatment Plant Outfall
- Groundwater Discharge Permit
- Impoundment with fish passage
- Impoundment
- Road Crossing
- Road Crossing within tidal area
- Impervious Surface

Population Density (persons/ac)

- 810
- 0

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BLACKS CREEK / QUINCY BAY ECOLOGICAL STRESSORS

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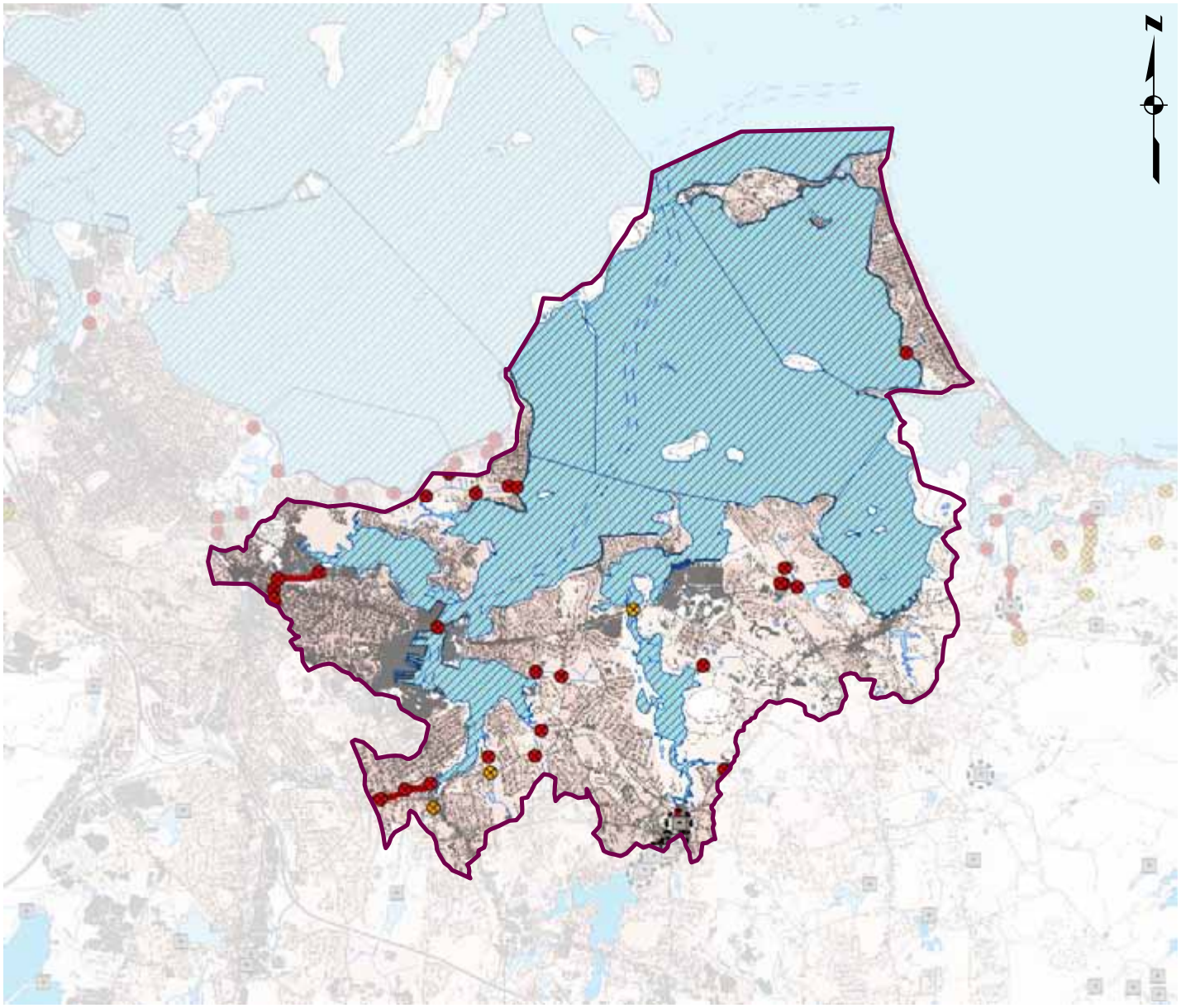

Legend

- Estuarine Watershed Boundary
- 303(d) Impairment for Nutrients (stream)
- 303(d) Impairment for Nutrients (water body)
- 303(d) Impairment for Bacteria (stream)
- 303(d) Impairment for Bacteria (water body)
- Wastewater Treatment Plant Outfall
- Groundwater Discharge Permit
- Impoundment with fish passage
- Impoundment
- Road Crossing
- Road Crossing within tidal area
- Impervious Surface

Population Density (persons/ac)

810

0

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BACK RIVER / FORE RIVER / HINGHAM BAY
ECOLOGICAL STRESSORS

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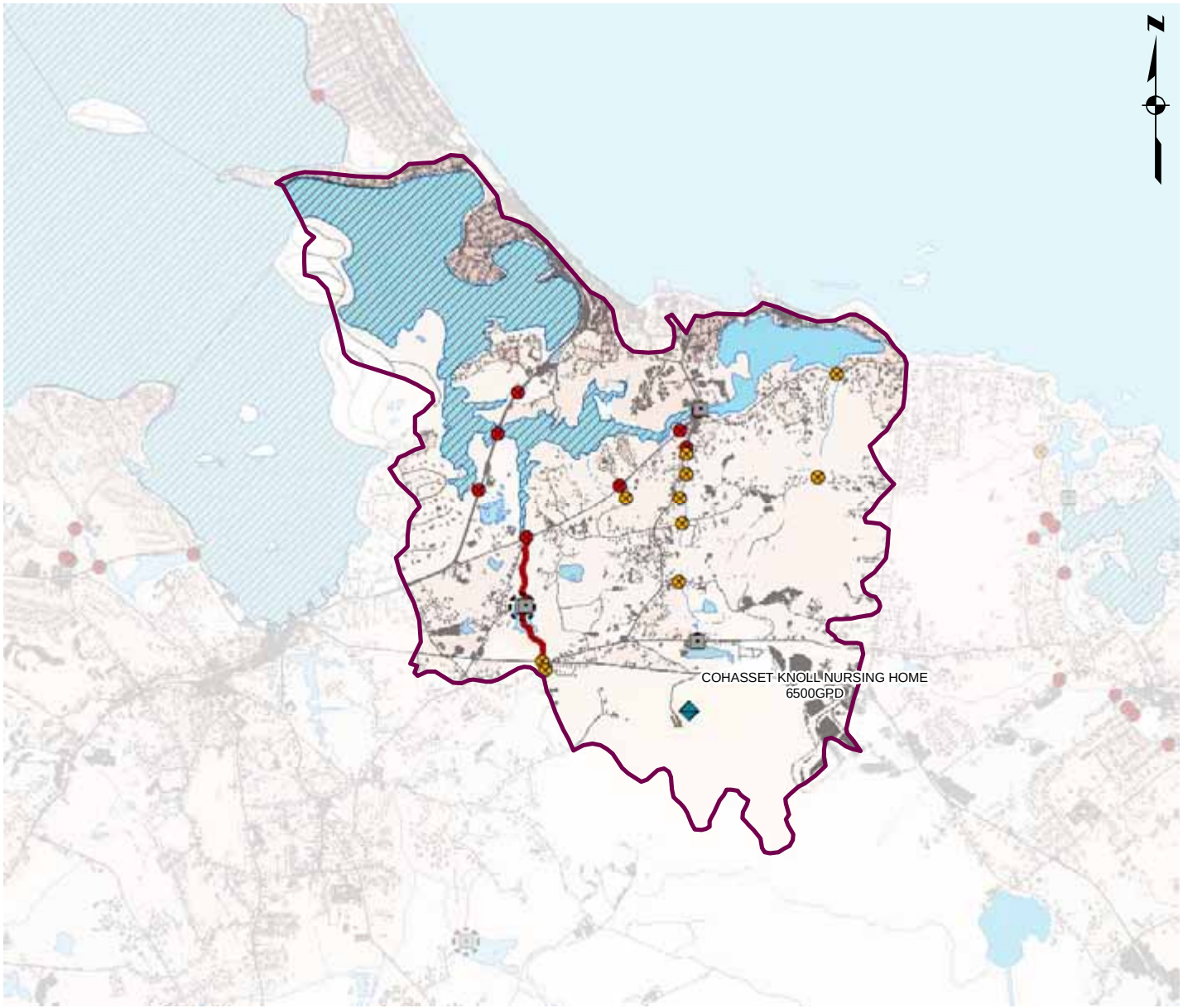

Legend

- Estuarine Watershed Boundary
- 303(d) Impairment for Nutrients (stream)
- 303(d) Impairment for Nutrients (water body)
- 303(d) Impairment for Bacteria (stream)
- 303(d) Impairment for Bacteria (water body)
- Wastewater Treatment Plant Outfall
- Groundwater Discharge Permit
- Impoundment with fish passage
- Impoundment
- Road Crossing
- Road Crossing within tidal area
- Impervious Surface

Population Density (persons/ac)

810

0

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WEIR RIVER / STRAITS POND ECOLOGICAL STRESSORS

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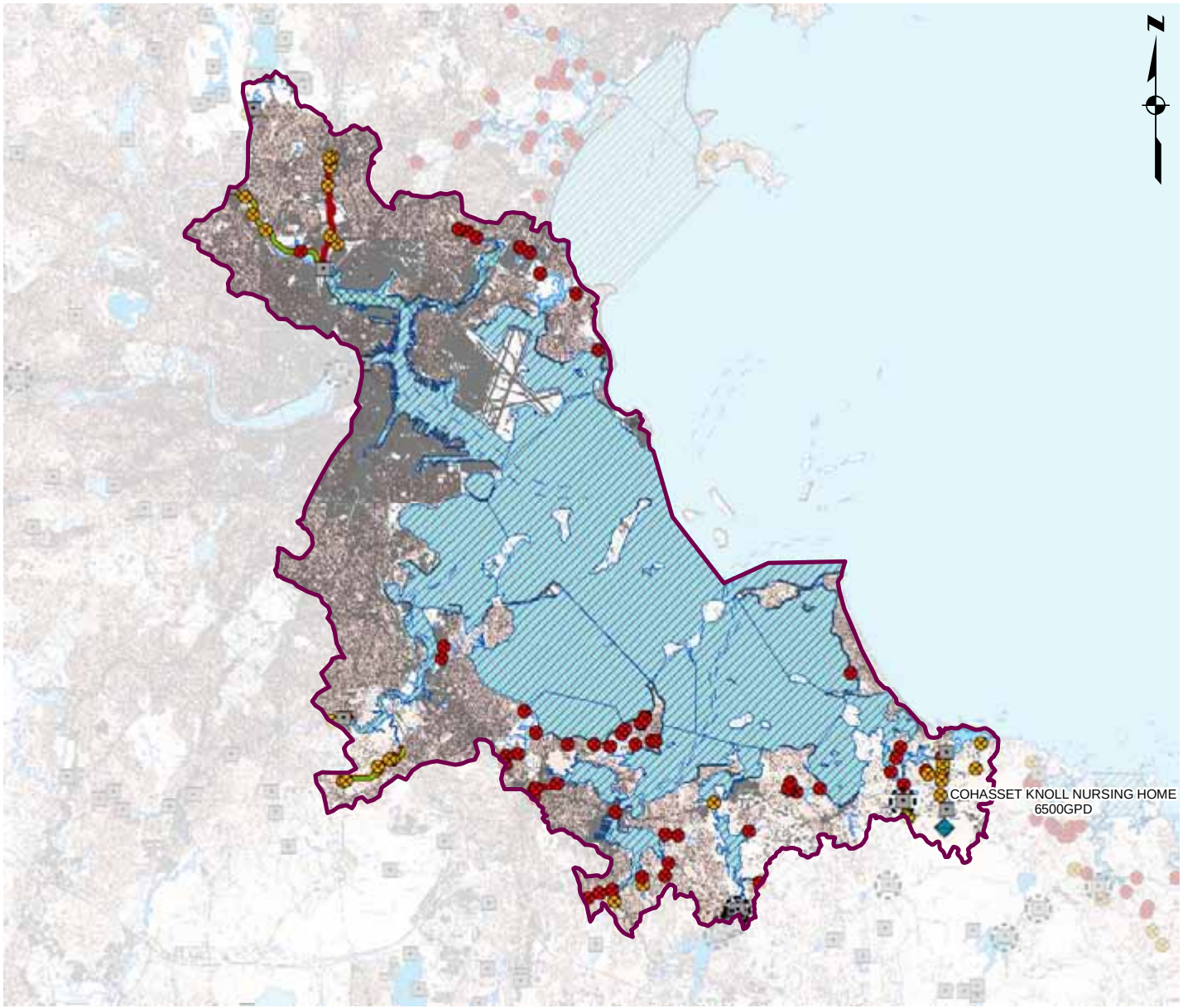

Legend

- Estuarine Watershed Boundary
- 303(d) Impairment for Nutrients (stream)
- 303(d) Impairment for Nutrients (water body)
- 303(d) Impairment for Bacteria (stream)
- 303(d) Impairment for Bacteria (water body)
- Wastewater Treatment Plant Outfall
- Groundwater Discharge Permit
- Impoundment with fish passage
- Impoundment
- Road Crossing
- Road Crossing within tidal area
- Impervious Surface

Population Density (persons/ac)

810

0

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BOSTON HARBOR ECOLOGICAL STRESSORS

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Legend

- Estuarine Watershed Boundary
- 303(d) Impairment for Nutrients (stream)
- 303(d) Impairment for Nutrients (water body)
- 303(d) Impairment for Bacteria (stream)
- 303(d) Impairment for Bacteria (water body)
- Wastewater Treatment Plant Outfall
- Groundwater Discharge Permit
- Impoundment with fish passage
- Impoundment
- Road Crossing
- Road Crossing within tidal area
- Impervious Surface

Population Density (persons/ac)

- 810
- 0

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LITTLE HARBOR
ECOLOGICAL STRESSORS

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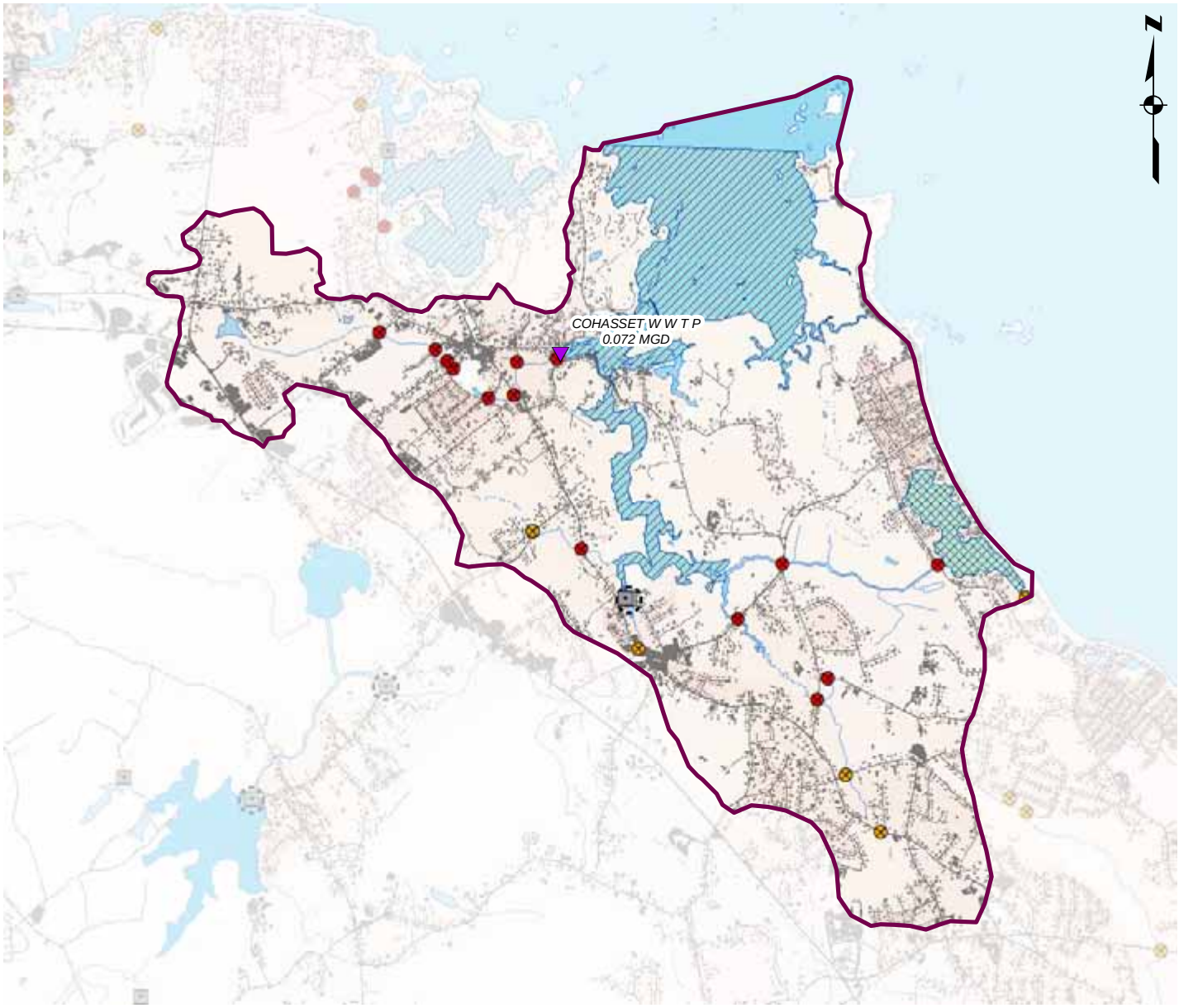

Legend

- Estuarine Watershed Boundary
- 303(d) Impairment for Nutrients (stream)
- 303(d) Impairment for Nutrients (water body)
- 303(d) Impairment for Bacteria (stream)
- 303(d) Impairment for Bacteria (water body)
- Wastewater Treatment Plant Outfall
- Groundwater Discharge Permit
- Impoundment with fish passage
- Impoundment
- Road Crossing
- Road Crossing within tidal area
- Impervious Surface

Population Density (persons/ac)

810

0

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COHASSET HARBOR ECOLOGICAL STRESSORS

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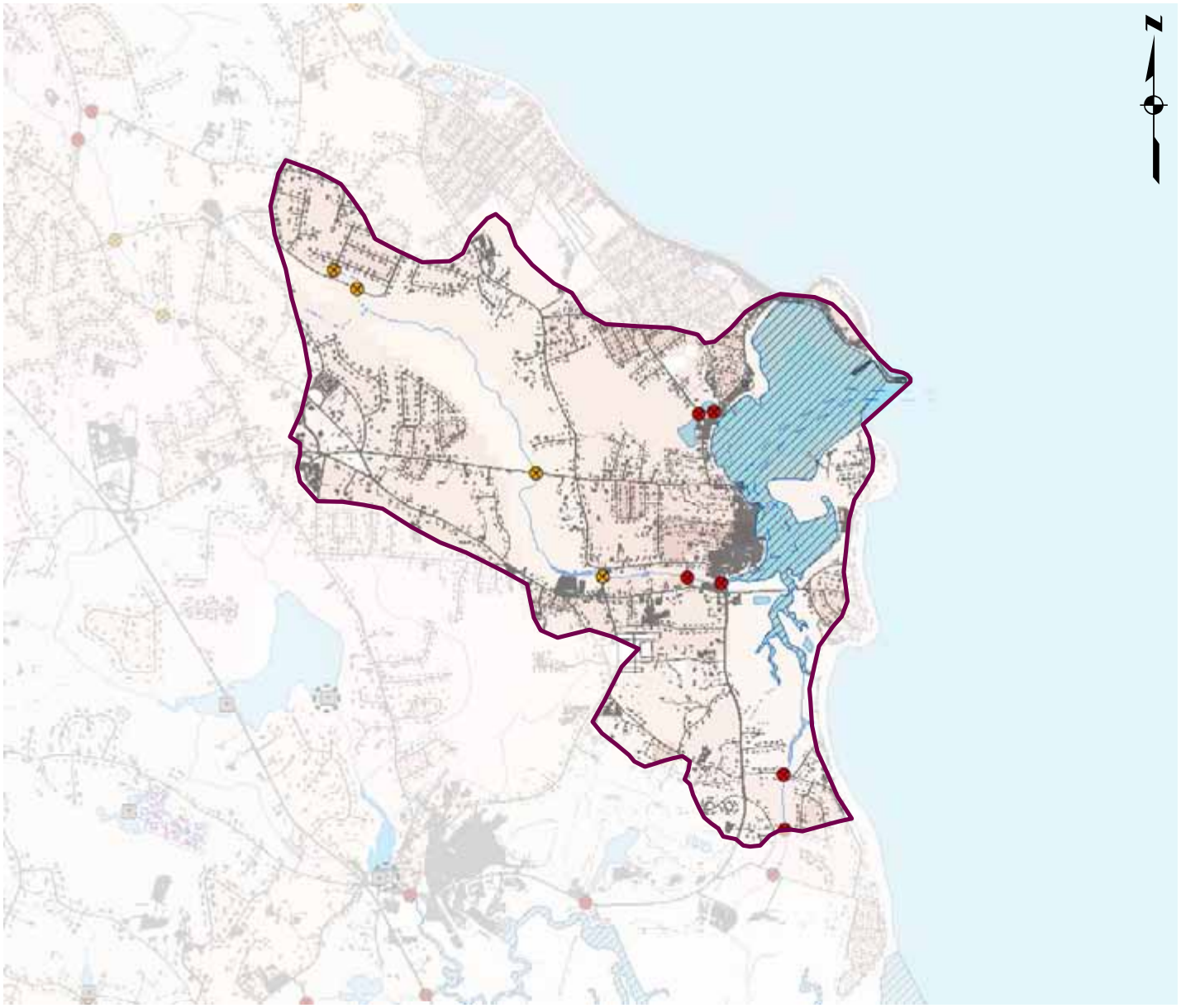

Legend

- Estuarine Watershed Boundary
- 303(d) Impairment for Nutrients (stream)
- 303(d) Impairment for Nutrients (water body)
- 303(d) Impairment for Bacteria (stream)
- 303(d) Impairment for Bacteria (water body)
- Wastewater Treatment Plant Outfall
- Groundwater Discharge Permit
- Impoundment with fish passage
- Impoundment
- Road Crossing
- Road Crossing within tidal area
- Impervious Surface

Population Density (persons/ac)

810

0

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SCITUATE HARBOR ECOLOGICAL STRESSORS

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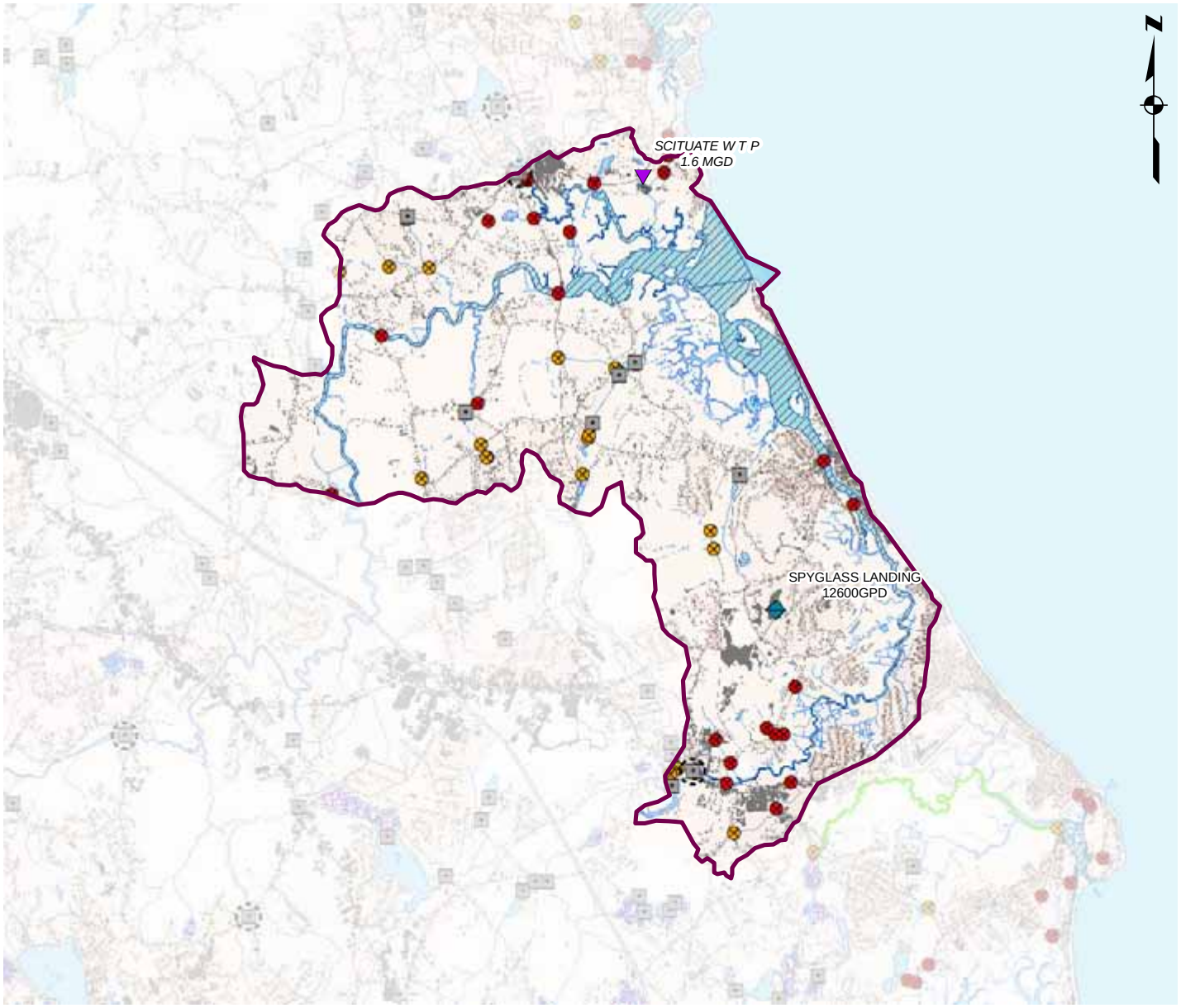

Legend

- Estuarine Watershed Boundary
- 303(d) Impairment for Nutrients (stream)
- 303(d) Impairment for Nutrients (water body)
- 303(d) Impairment for Bacteria (stream)
- 303(d) Impairment for Bacteria (water body)
- Wastewater Treatment Plant Outfall
- Groundwater Discharge Permit
- Impoundment with fish passage
- Impoundment
- Road Crossing
- Road Crossing within tidal area
- Impervious Surface

Population Density (persons/ac)

810

0

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NORTH RIVER / SOUTH RIVER ECOLOGICAL STRESSORS

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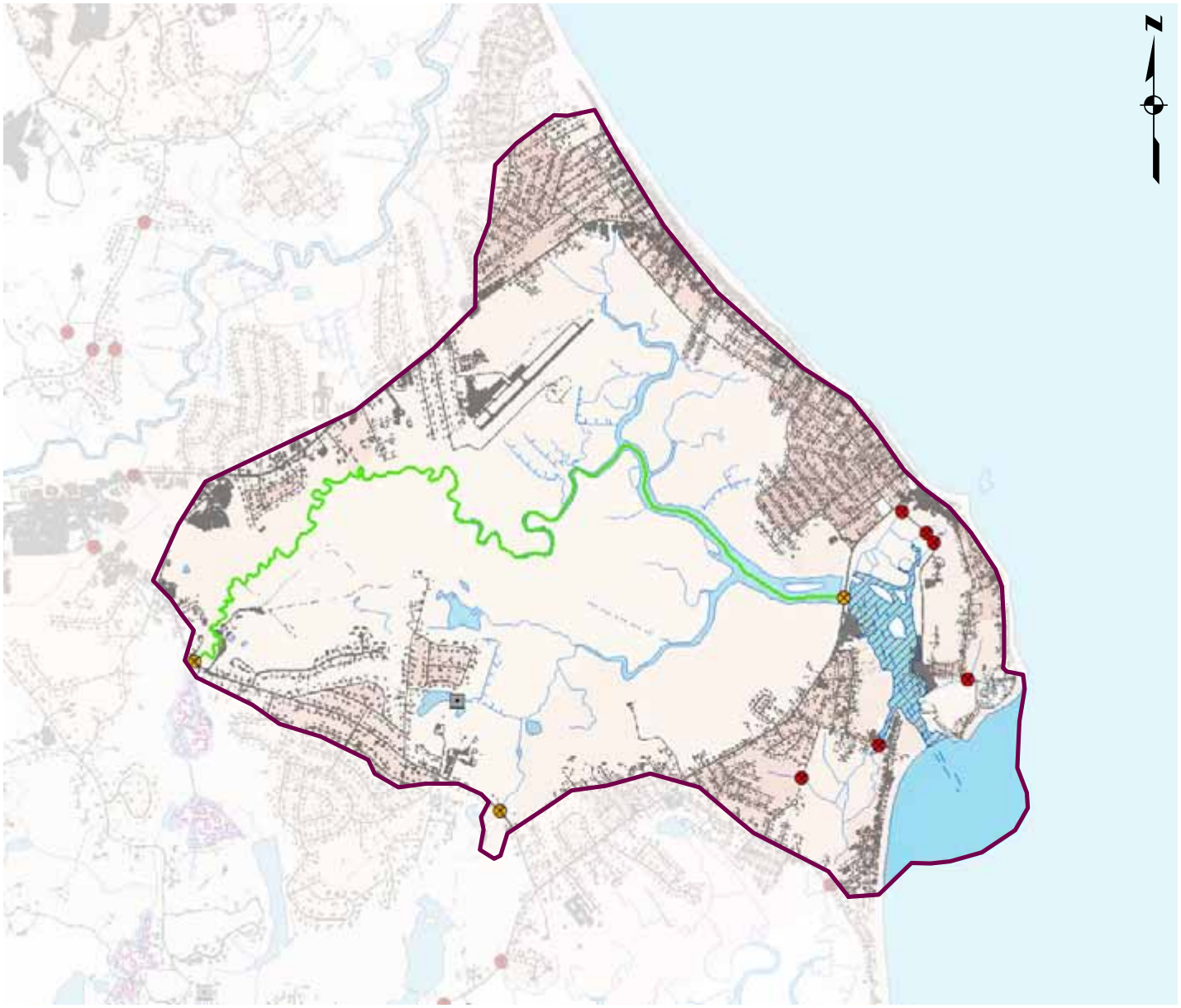

Legend

- Estuarine Watershed Boundary
- 303(d) Impairment for Nutrients (stream)
- 303(d) Impairment for Nutrients (water body)
- 303(d) Impairment for Bacteria (stream)
- 303(d) Impairment for Bacteria (water body)
- Wastewater Treatment Plant Outfall
- Groundwater Discharge Permit
- Impoundment with fish passage
- Impoundment
- Road Crossing
- Road Crossing within tidal area
- Impervious Surface

Population Density (persons/ac)

- 810
- 0

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GREEN HARBOR
ECOLOGICAL STRESSORS

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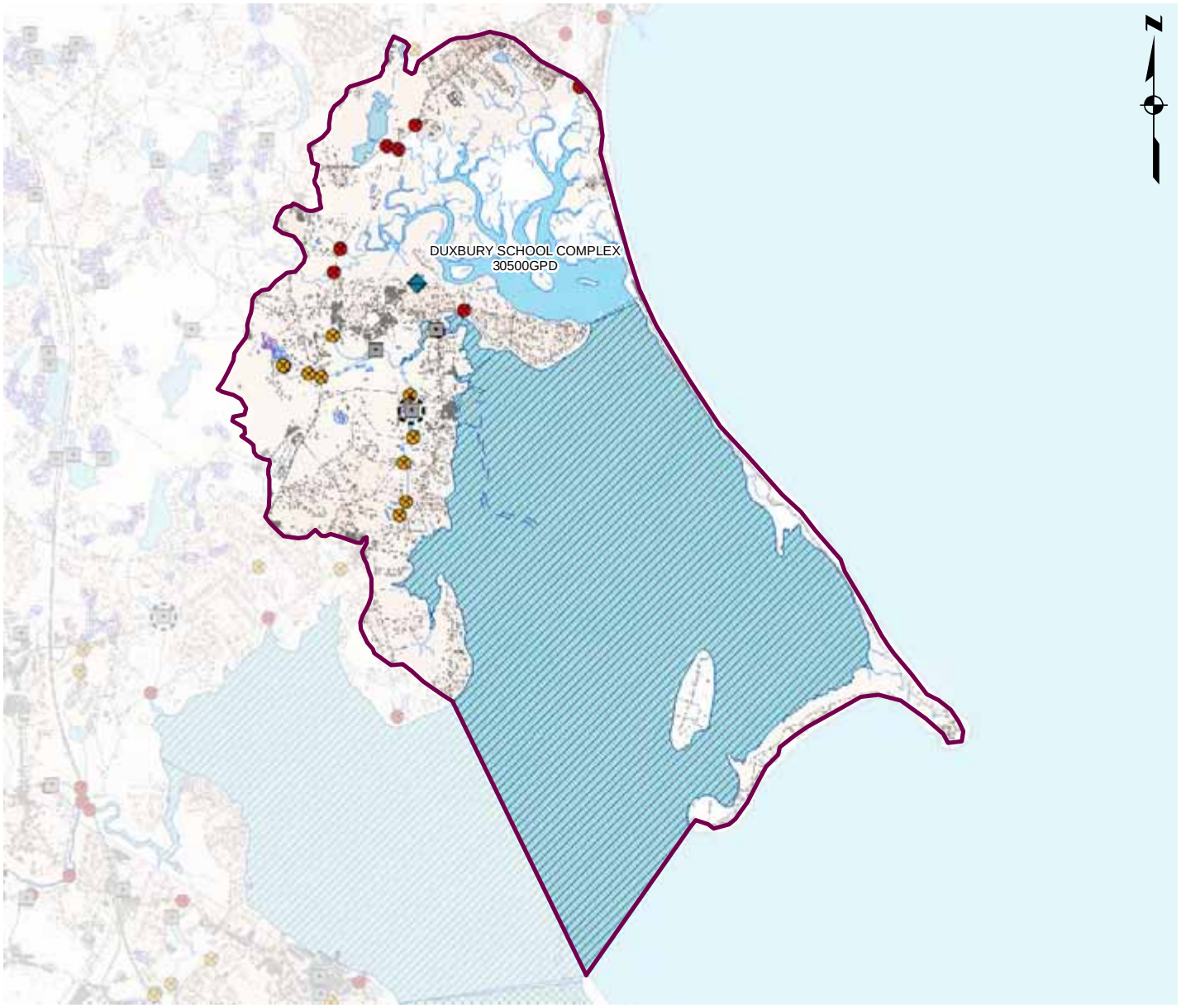

Legend

- Estuarine Watershed Boundary
- 303(d) Impairment for Nutrients (stream)
- 303(d) Impairment for Nutrients (water body)
- 303(d) Impairment for Bacteria (stream)
- 303(d) Impairment for Bacteria (water body)
- Wastewater Treatment Plant Outfall
- Groundwater Discharge Permit
- Impoundment with fish passage
- Impoundment
- Road Crossing
- Road Crossing within tidal area
- Impervious Surface

Population Density (persons/ac)

810

0

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BLUEFISH RIVER / BACK RIVER / DUXBURY BAY
ECOLOGICAL STRESSORS

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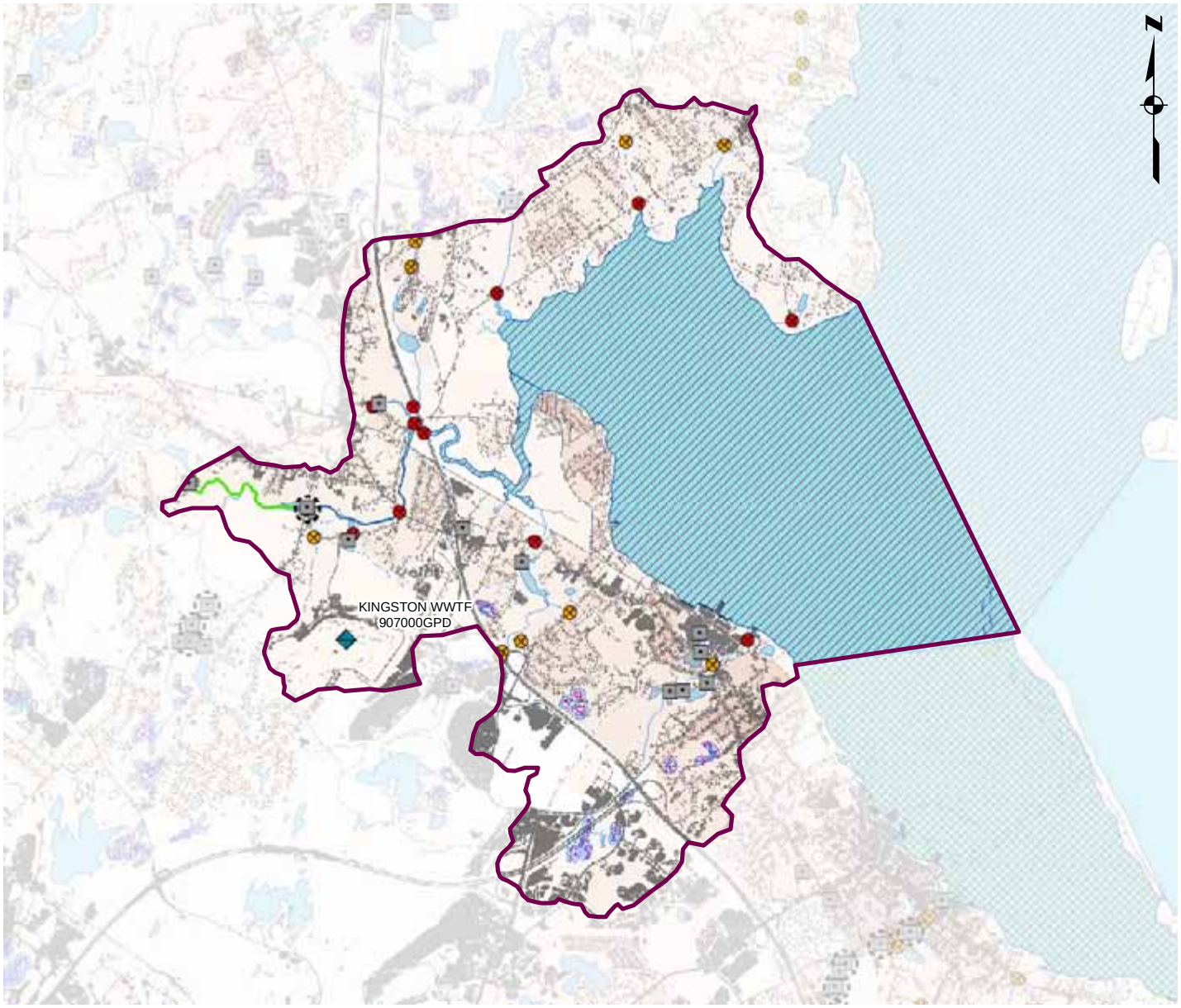

Legend

- Estuarine Watershed Boundary
- 303(d) Impairment for Nutrients (stream)
- 303(d) Impairment for Nutrients (water body)
- 303(d) Impairment for Bacteria (stream)
- 303(d) Impairment for Bacteria (water body)
- Wastewater Treatment Plant Outfall
- Groundwater Discharge Permit
- Impoundment with fish passage
- Impoundment
- Road Crossing
- Road Crossing within tidal area
- Impervious Surface

Population Density (persons/ac)

810

0

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JONES RIVER / KINGSTON BAY ECOLOGICAL STRESSORS

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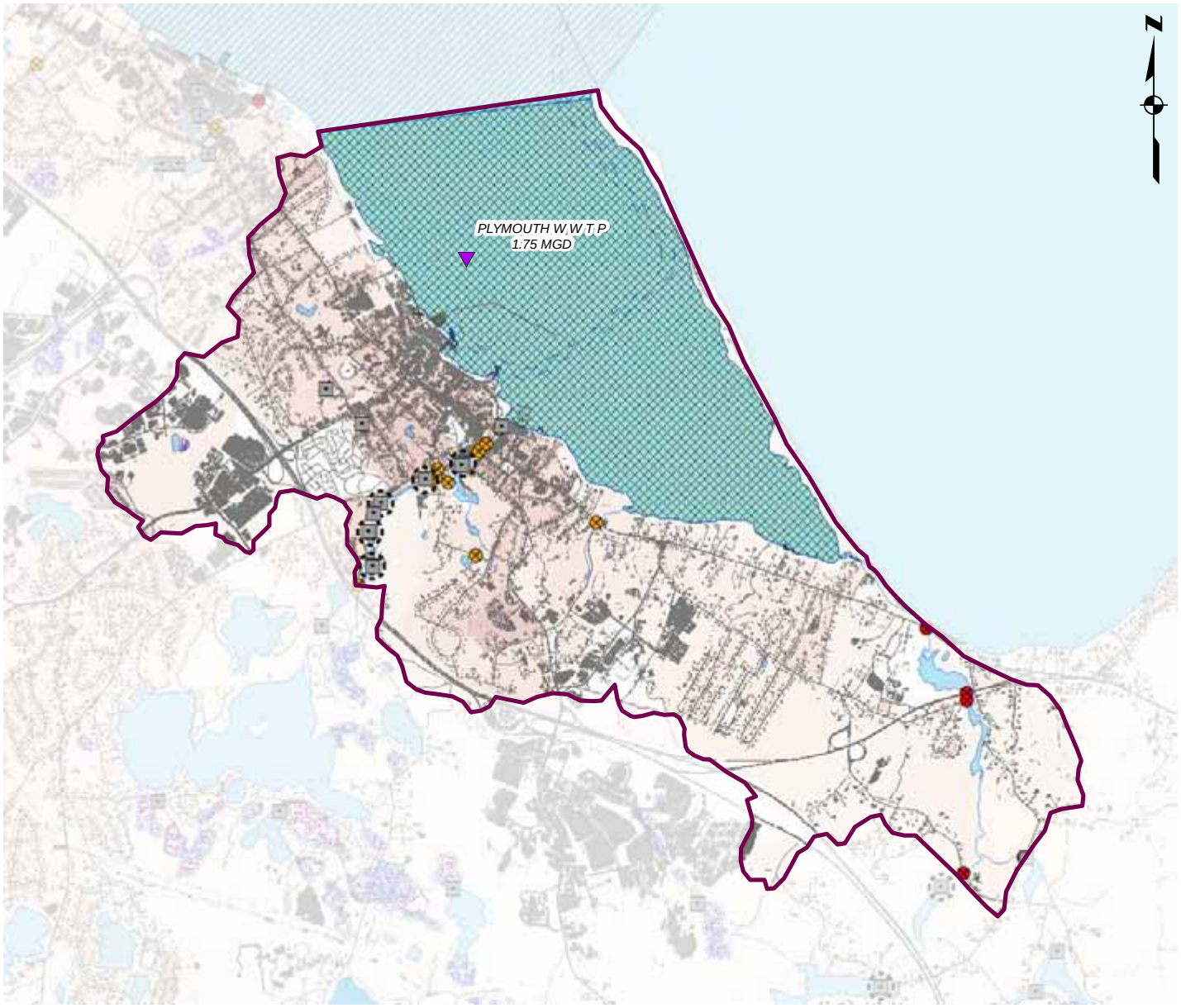

Legend

- Estuarine Watershed Boundary
- 303(d) Impairment for Nutrients (stream)
- 303(d) Impairment for Nutrients (water body)
- 303(d) Impairment for Bacteria (stream)
- 303(d) Impairment for Bacteria (water body)
- Wastewater Treatment Plant Outfall
- Groundwater Discharge Permit
- Impoundment with fish passage
- Impoundment
- Road Crossing
- Road Crossing within tidal area
- Impervious Surface

Population Density (persons/ac)

810

0

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EEL RIVER / PLYMOUTH HARBOR ECOLOGICAL STRESSORS

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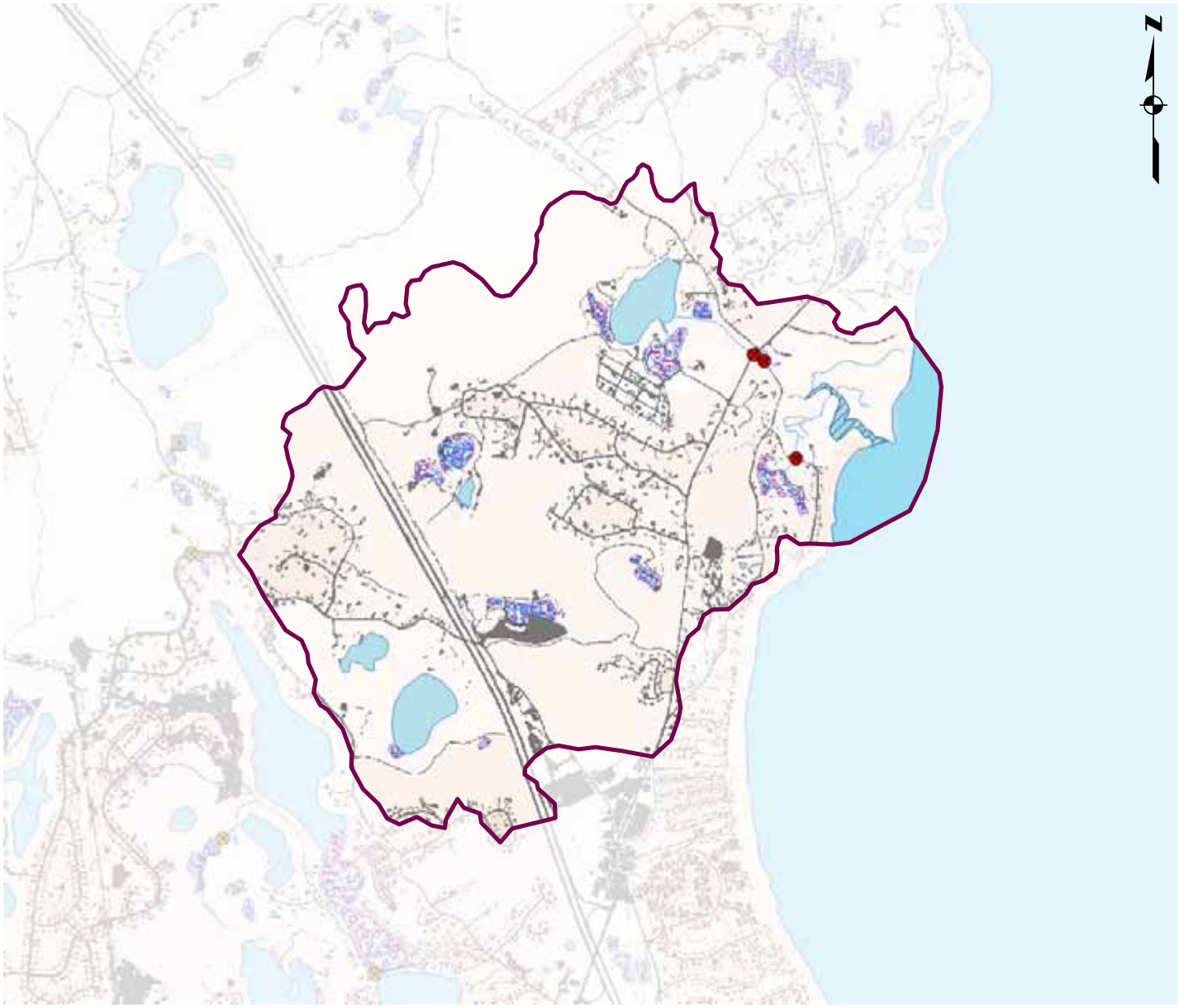

Legend

- Estuarine Watershed Boundary
- 303(d) Impairment for Nutrients (stream)
- 303(d) Impairment for Nutrients (water body)
- 303(d) Impairment for Bacteria (stream)
- 303(d) Impairment for Bacteria (water body)
- Wastewater Treatment Plant Outfall
- Groundwater Discharge Permit
- Impoundment with fish passage
- Impoundment
- Road Crossing
- Road Crossing within tidal area
- Impervious Surface

Population Density (persons/ac)

- 810
- 0

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ELLISVILLE HARBOR
ECOLOGICAL STRESSORS

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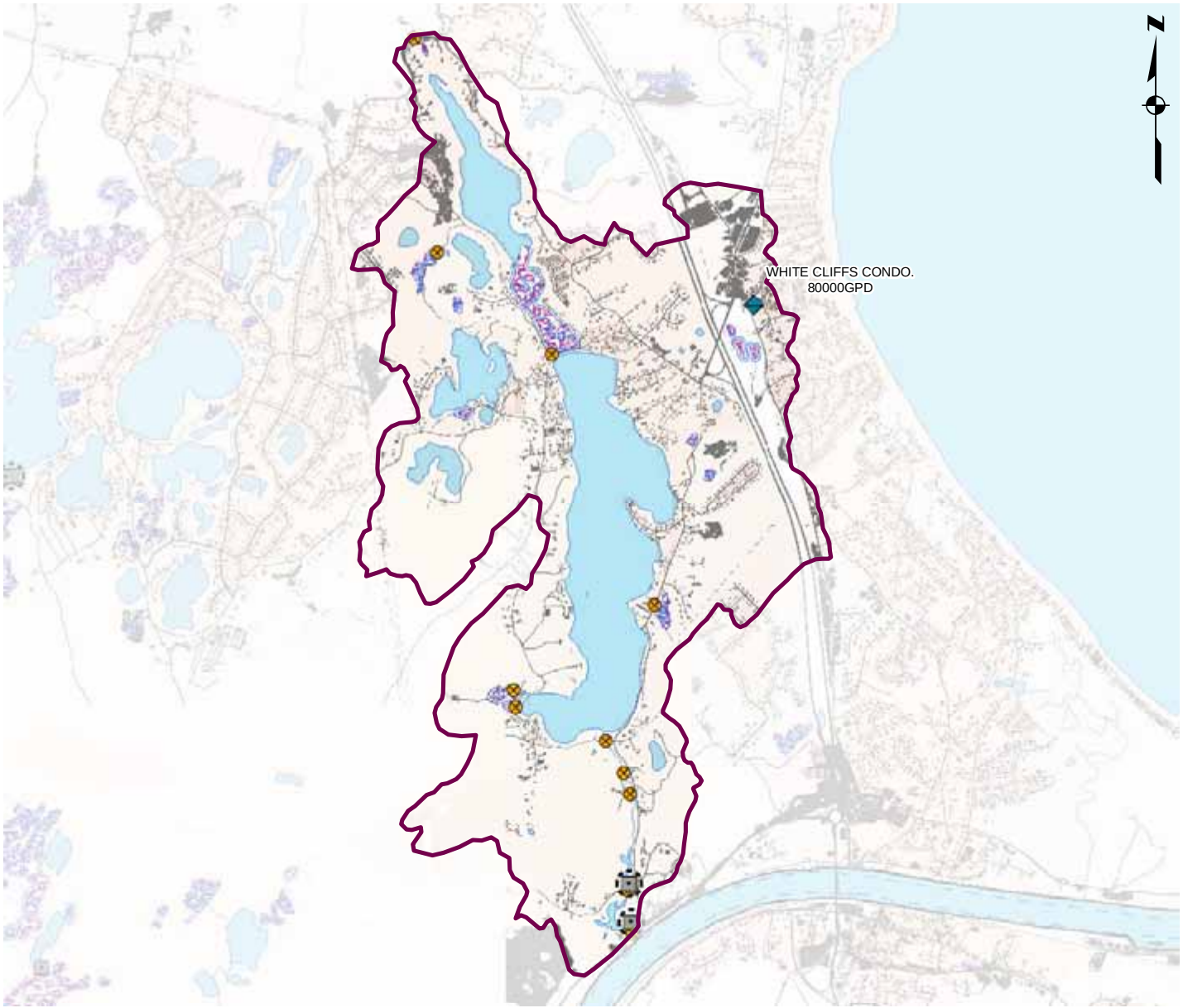

Legend

- Estuarine Watershed Boundary
- 303(d) Impairment for Nutrients (stream)
- 303(d) Impairment for Nutrients (water body)
- 303(d) Impairment for Bacteria (stream)
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- Groundwater Discharge Permit
- Impoundment with fish passage
- Impoundment
- Road Crossing
- Road Crossing within tidal area
- Impervious Surface

Population Density (persons/ac)

810

0

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GREAT HERRING POND / BOURNEDALE ECOLOGICAL STRESSORS

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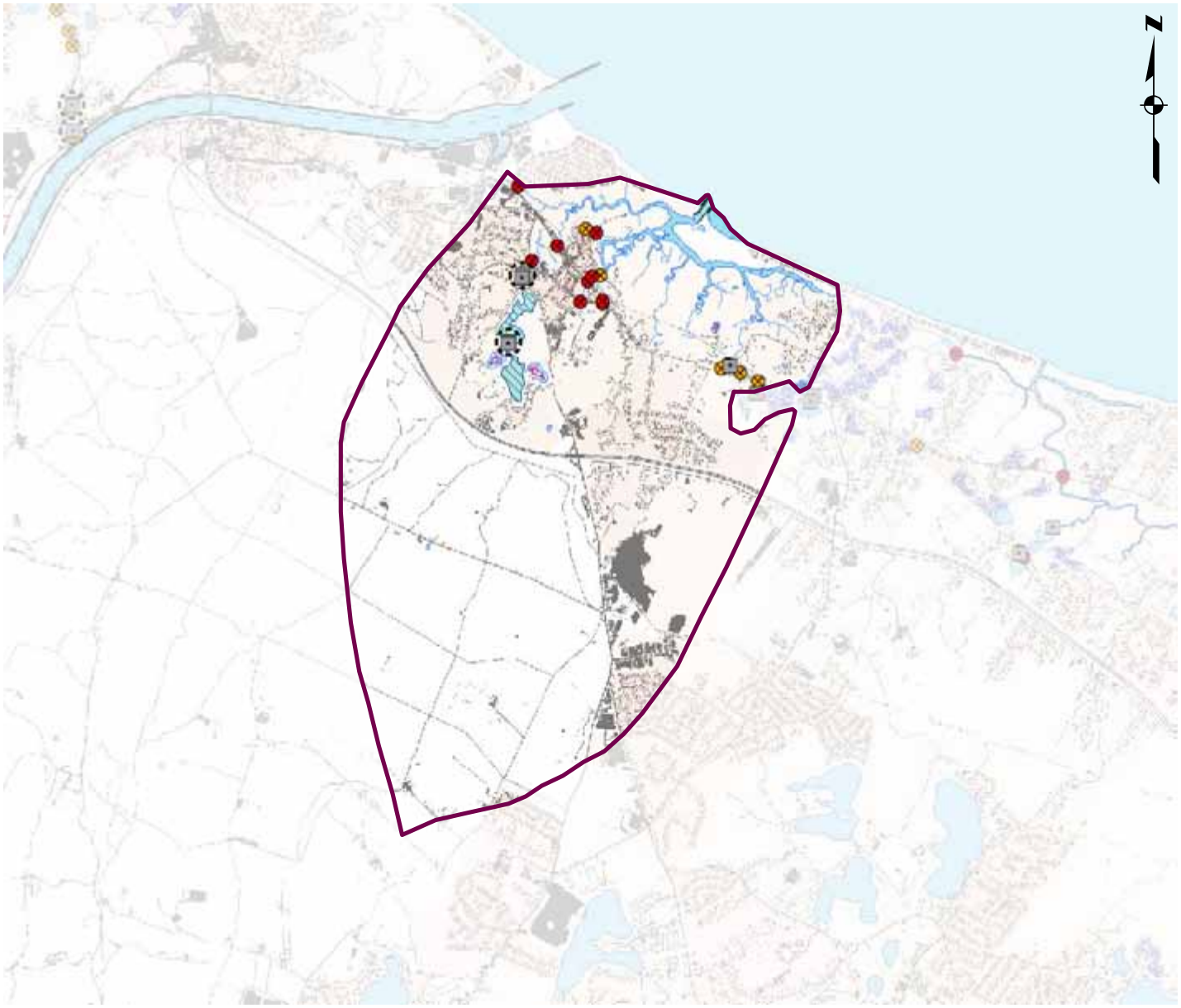

Legend

- Estuarine Watershed Boundary
- 303(d) Impairment for Nutrients (stream)
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- 303(d) Impairment for Bacteria (water body)
- Wastewater Treatment Plant Outfall
- Groundwater Discharge Permit
- Impoundment with fish passage
- Impoundment
- Road Crossing
- Road Crossing within tidal area
- Impervious Surface

Population Density (persons/ac)

- 810
- 0

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SANDWICH HARBOR ECOLOGICAL STRESSORS

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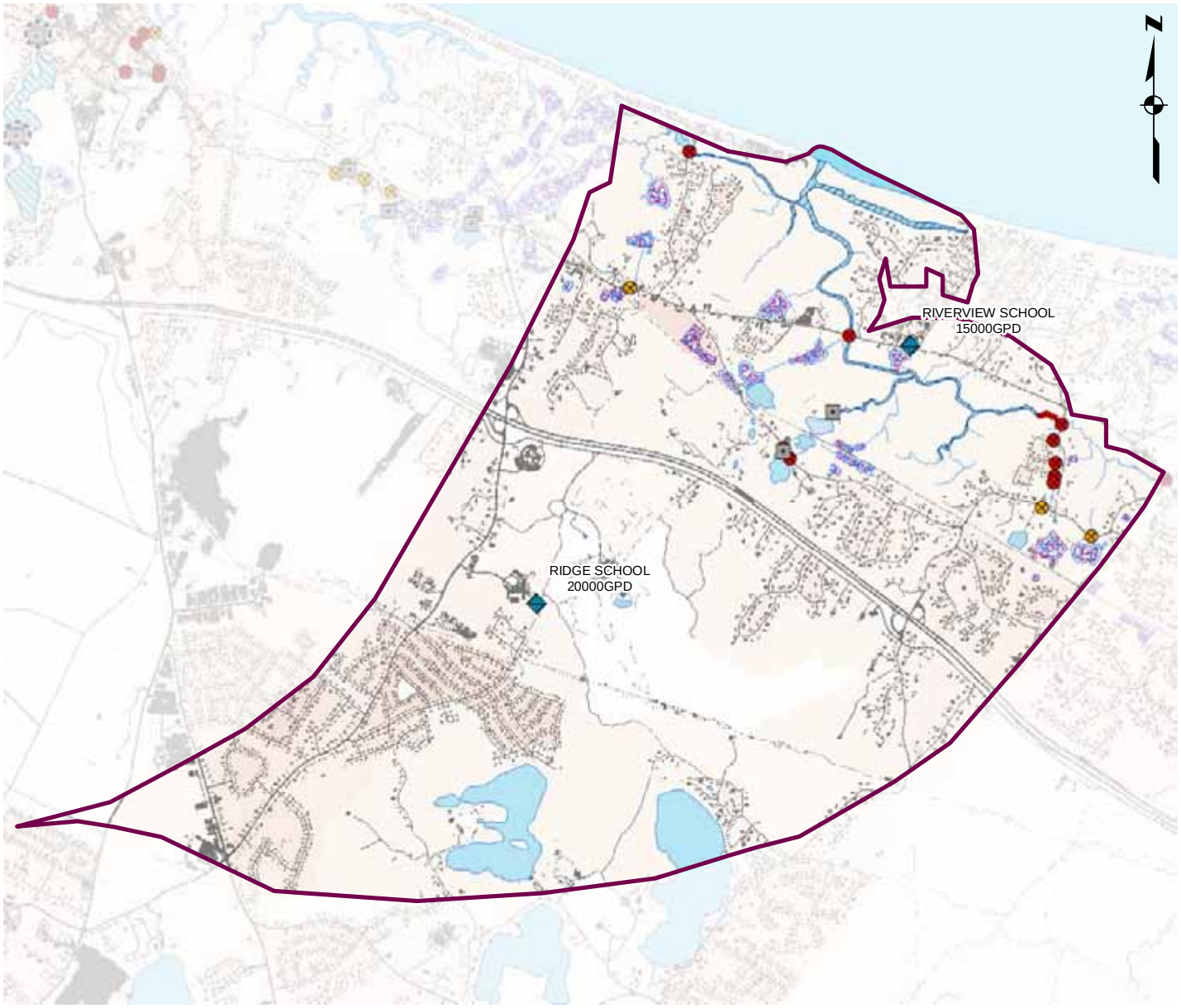

Legend

- Estuarine Watershed Boundary
- 303(d) Impairment for Nutrients (stream)
- 303(d) Impairment for Nutrients (water body)
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- 303(d) Impairment for Bacteria (water body)
- Wastewater Treatment Plant Outfall
- Groundwater Discharge Permit
- Impoundment with fish passage
- Impoundment
- Road Crossing
- Road Crossing within tidal area
- Impervious Surface

Population Density (persons/ac)

810

0

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SCORTON CREEK
ECOLOGICAL STRESSORS

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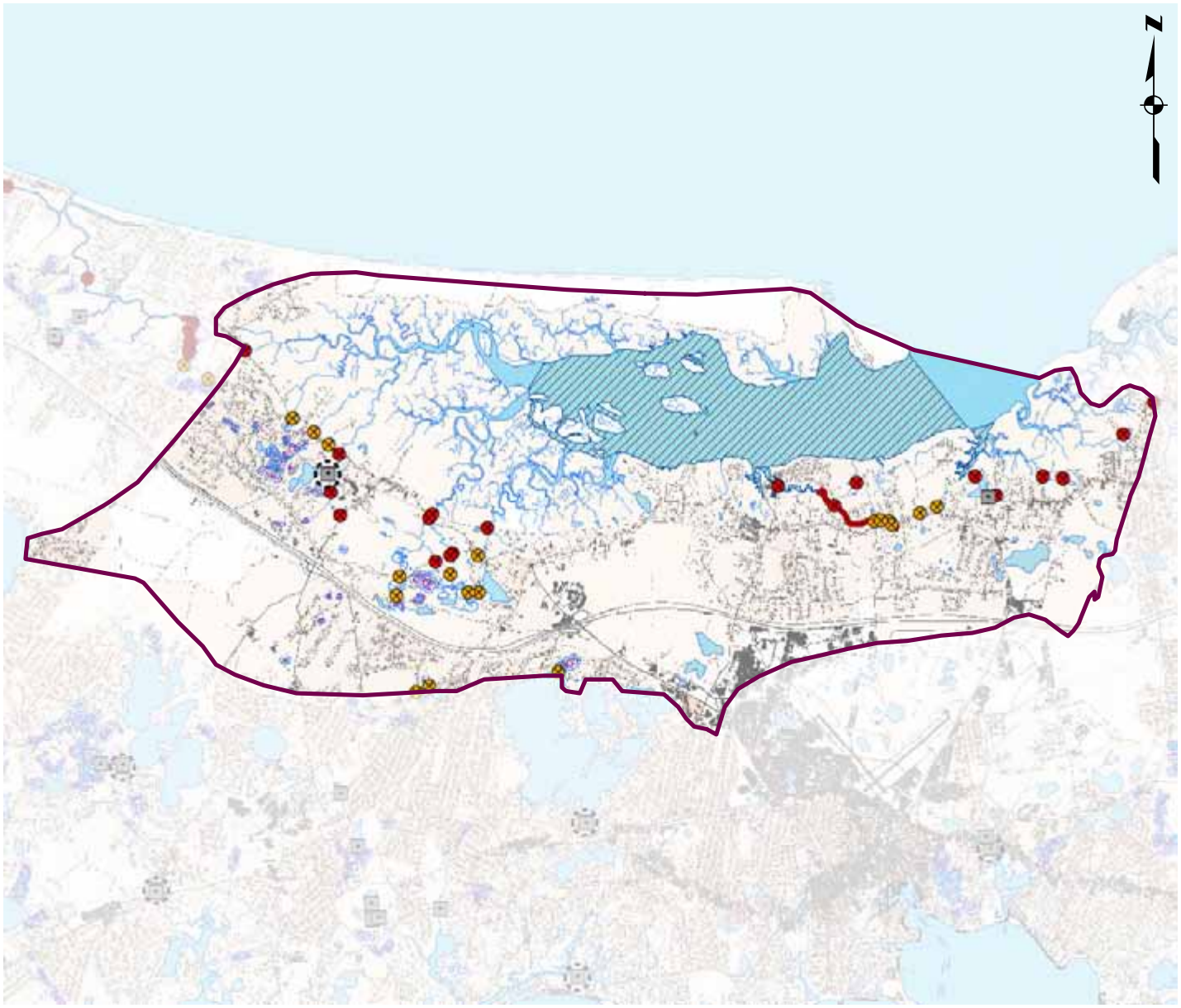

Legend

- Estuarine Watershed Boundary
- 303(d) Impairment for Nutrients (stream)
- 303(d) Impairment for Nutrients (water body)
- 303(d) Impairment for Bacteria (stream)
- 303(d) Impairment for Bacteria (water body)
- Wastewater Treatment Plant Outfall
- Groundwater Discharge Permit
- Impoundment with fish passage
- Impoundment
- Road Crossing
- Road Crossing within tidal area
- Impervious Surface

Population Density (persons/ac)

810

0

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BARNSTABLE HARBOR
ECOLOGICAL STRESSORS

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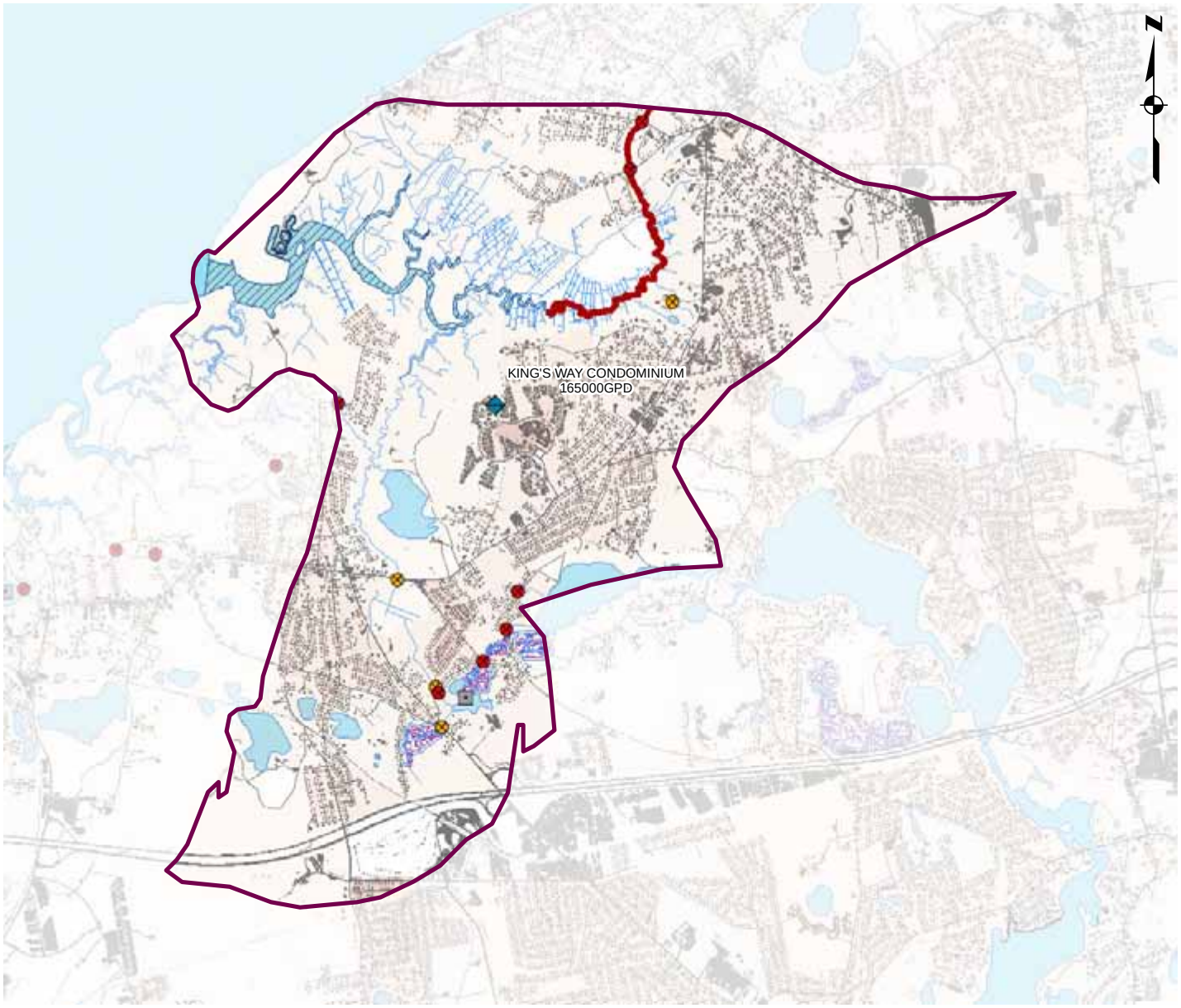

Legend

- Estuarine Watershed Boundary
- 303(d) Impairment for Nutrients (stream)
- 303(d) Impairment for Nutrients (water body)
- 303(d) Impairment for Bacteria (stream)
- 303(d) Impairment for Bacteria (water body)
- Wastewater Treatment Plant Outfall
- Groundwater Discharge Permit
- Impoundment with fish passage
- Impoundment
- Road Crossing
- Road Crossing within tidal area
- Impervious Surface

Population Density (persons/ac)

810

0

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CHASE GARDEN CREEK ECOLOGICAL STRESSORS

Map 37 of 47

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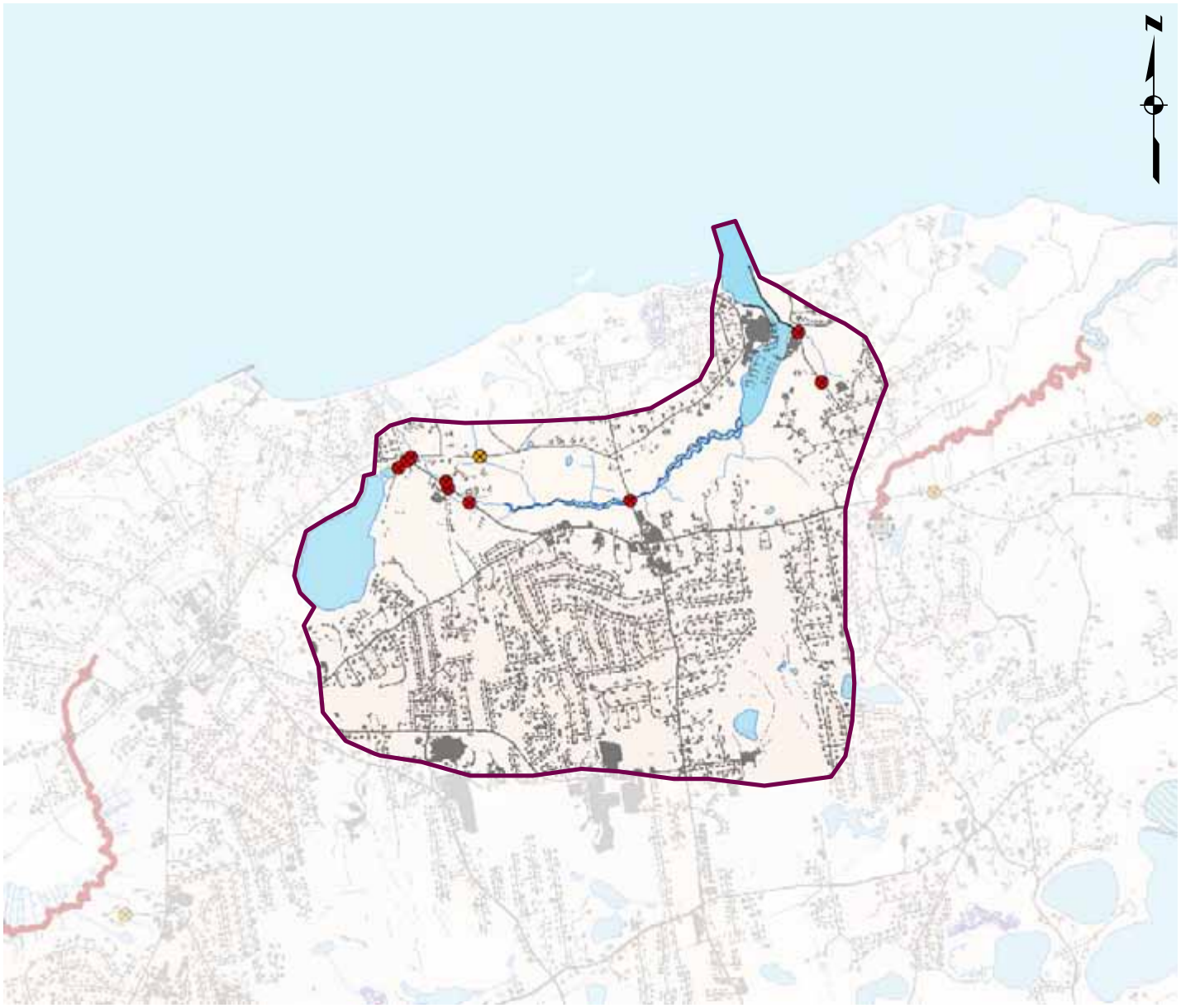

Legend

- Estuarine Watershed Boundary
- 303(d) Impairment for Nutrients (stream)
- 303(d) Impairment for Nutrients (water body)
- 303(d) Impairment for Bacteria (stream)
- 303(d) Impairment for Bacteria (water body)
- Wastewater Treatment Plant Outfall
- Groundwater Discharge Permit
- Impoundment with fish passage
- Impoundment
- Road Crossing
- Road Crossing within tidal area
- Impervious Surface

Population Density (persons/ac)

810

0

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SESUIT CREEK / SESUIT HARBOR ECOLOGICAL STRESSORS

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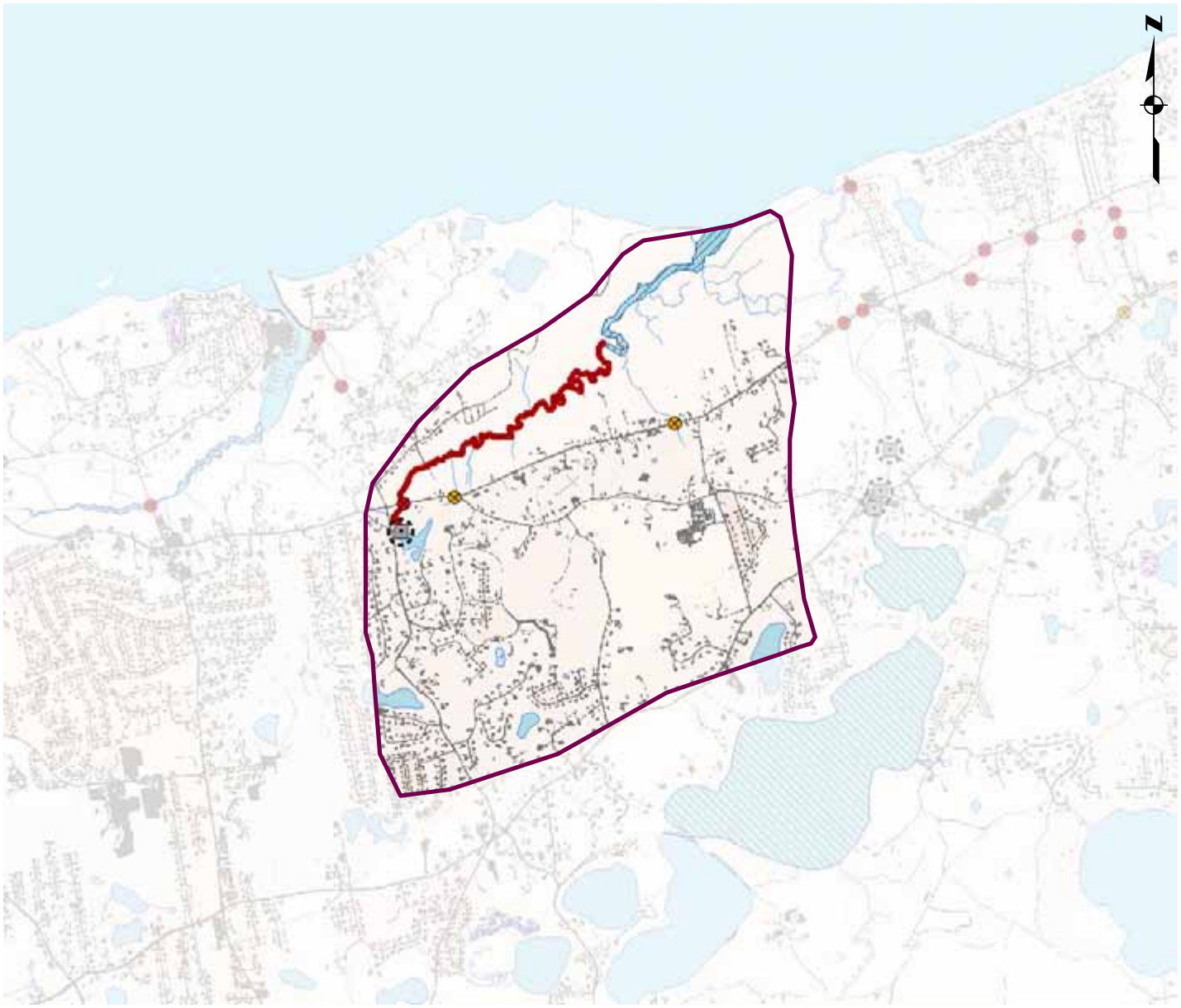

Legend

- Estuarine Watershed Boundary
- 303(d) Impairment for Nutrients (stream)
- 303(d) Impairment for Nutrients (water body)
- 303(d) Impairment for Bacteria (stream)
- 303(d) Impairment for Bacteria (water body)
- Wastewater Treatment Plant Outfall
- Groundwater Discharge Permit
- Impoundment with fish passage
- Impoundment
- Road Crossing
- Road Crossing within tidal area
- Impervious Surface

Population Density (persons/ac)

810

0

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QUIVETT CREEK
ECOLOGICAL STRESSORS

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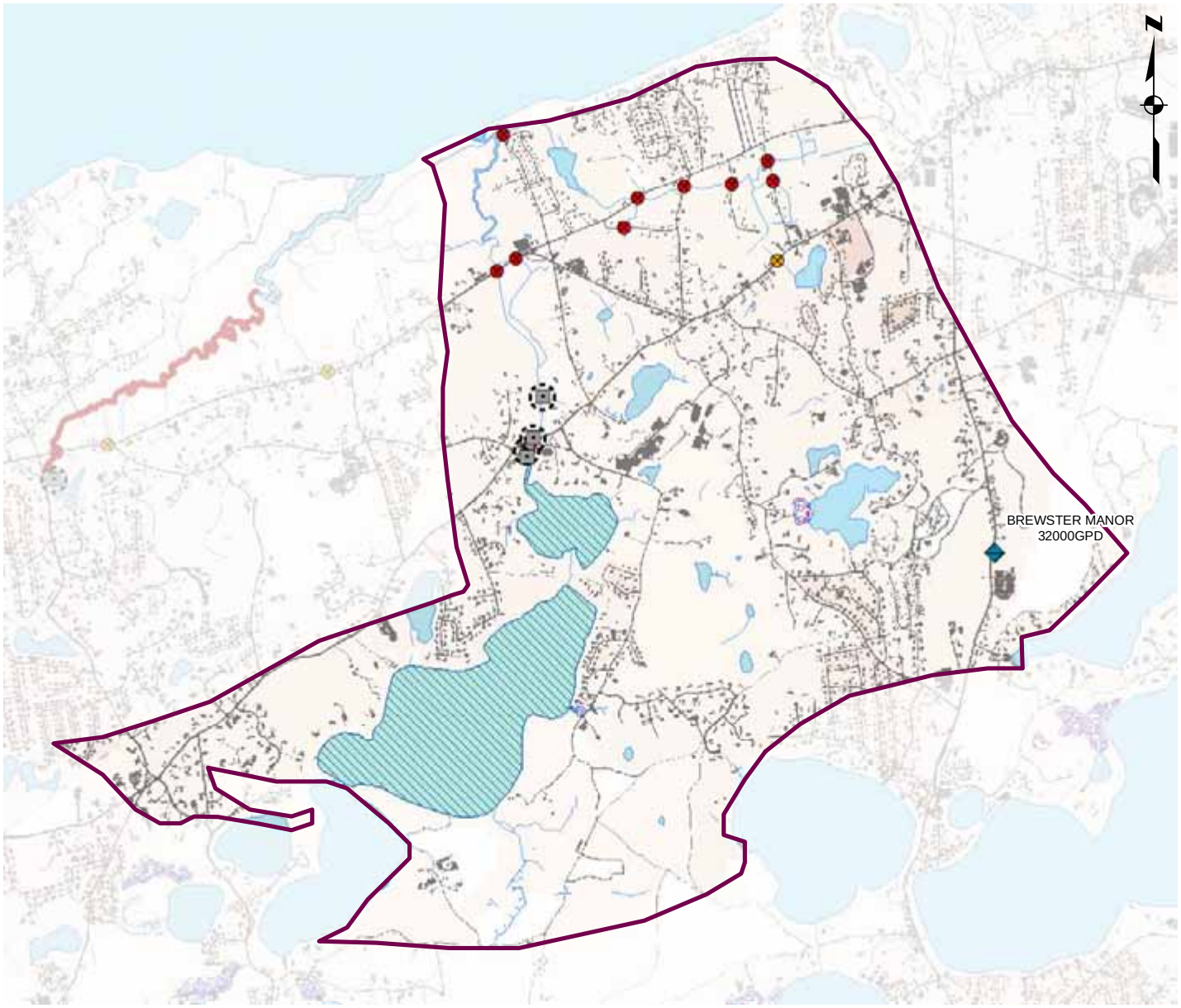

Legend

- Estuarine Watershed Boundary
- 303(d) Impairment for Nutrients (stream)
- 303(d) Impairment for Nutrients (water body)
- 303(d) Impairment for Bacteria (stream)
- 303(d) Impairment for Bacteria (water body)
- Wastewater Treatment Plant Outfall
- Groundwater Discharge Permit
- Impoundment with fish passage
- Impoundment
- Road Crossing
- Road Crossing within tidal area
- Impervious Surface

Population Density (persons/ac)

810

0

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PAINE'S CREEK / STONY BROOK ECOLOGICAL STRESSORS

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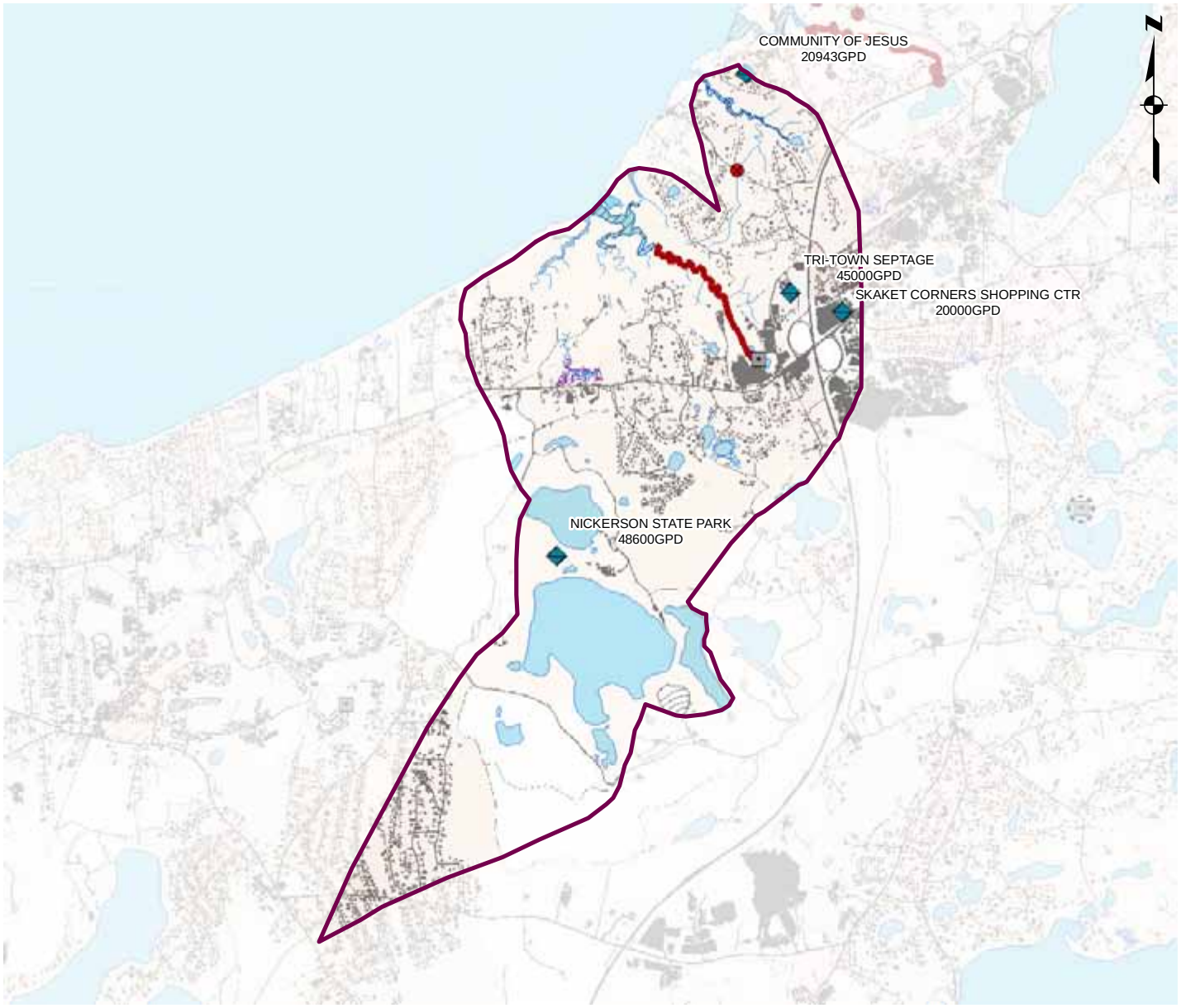

Legend

- Estuarine Watershed Boundary
- 303(d) Impairment for Nutrients (stream)
- 303(d) Impairment for Nutrients (water body)
- 303(d) Impairment for Bacteria (stream)
- 303(d) Impairment for Bacteria (water body)
- Wastewater Treatment Plant Outfall
- Groundwater Discharge Permit
- Impoundment with fish passage
- Impoundment
- Road Crossing
- Road Crossing within tidal area
- Impervious Surface

Population Density (persons/ac)

- 810
- 0

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NAMSKAKET CREEK / LITTLE NAMSKAKET CREEK ECOLOGICAL STRESSORS

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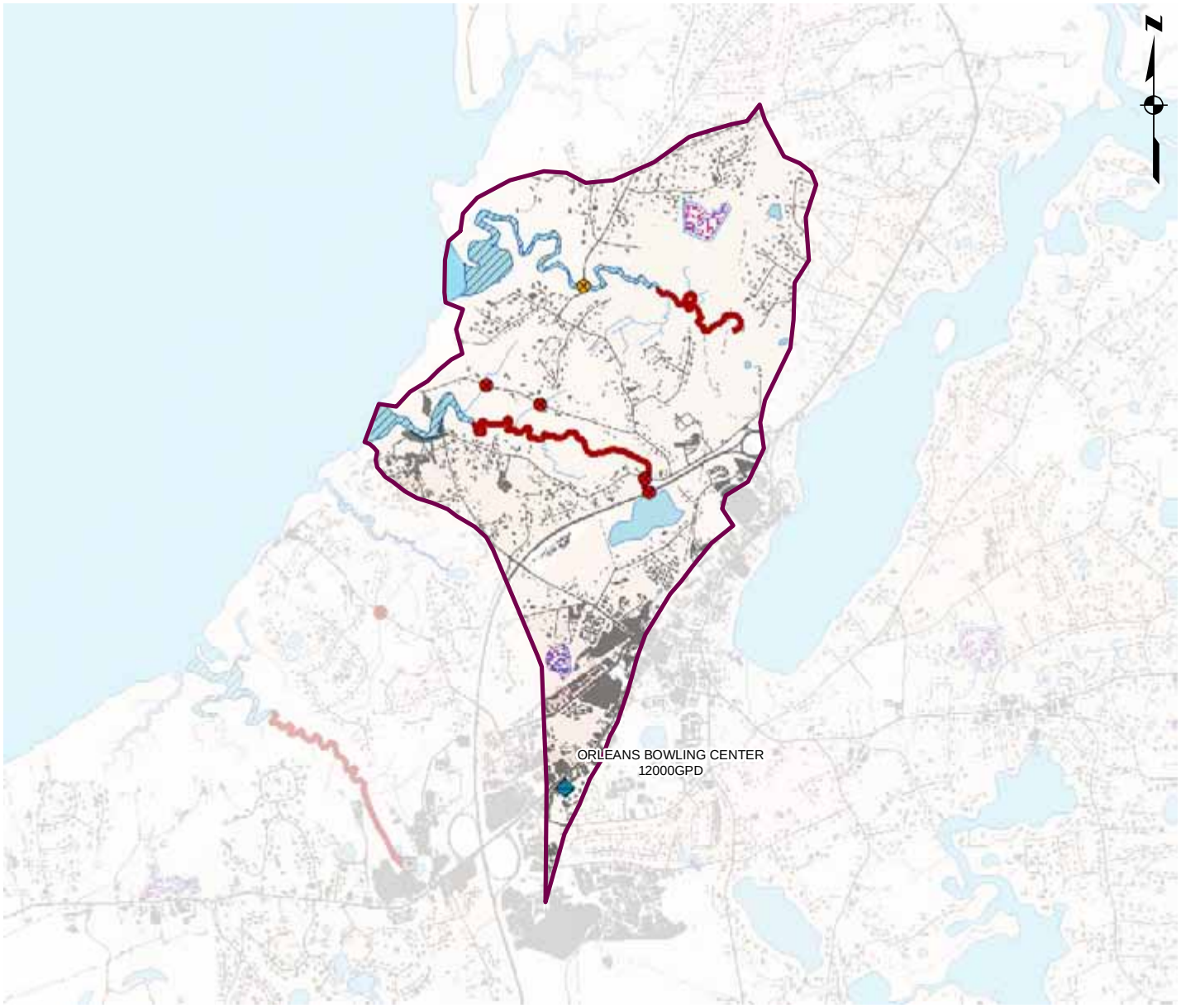

Legend

- Estuarine Watershed Boundary
- 303(d) Impairment for Nutrients (stream)
- 303(d) Impairment for Nutrients (water body)
- 303(d) Impairment for Bacteria (stream)
- 303(d) Impairment for Bacteria (water body)
- Wastewater Treatment Plant Outfall
- Groundwater Discharge Permit
- Impoundment with fish passage
- Impoundment
- Road Crossing
- Road Crossing within tidal area
- Impervious Surface

Population Density (persons/ac)

810

0

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BOAT MEADOW CREEK / ROCK HARBOR ECOLOGICAL STRESSORS

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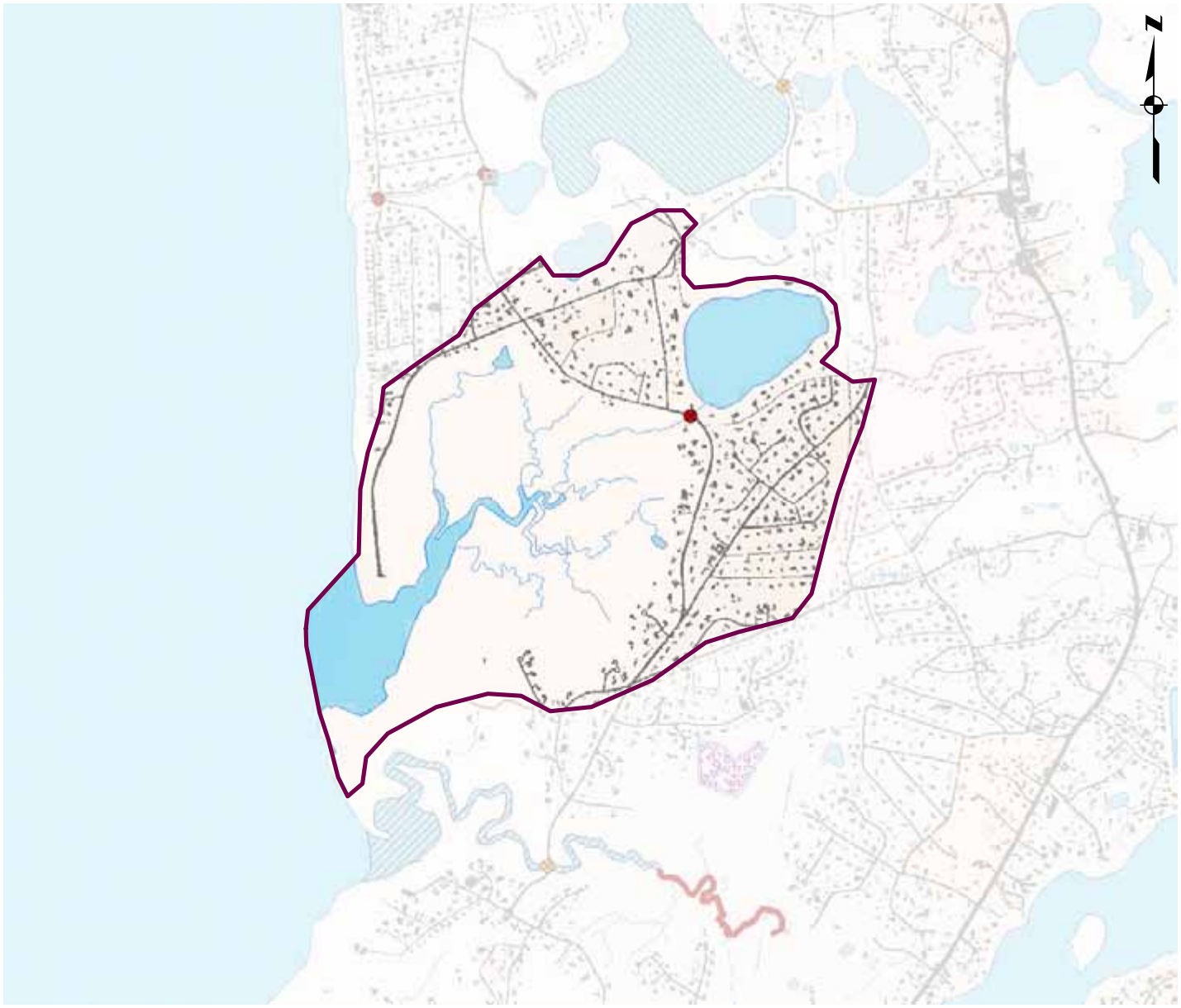

Legend

- Estuarine Watershed Boundary
- 303(d) Impairment for Nutrients (stream)
- 303(d) Impairment for Nutrients (water body)
- 303(d) Impairment for Bacteria (stream)
- 303(d) Impairment for Bacteria (water body)
- Wastewater Treatment Plant Outfall
- Groundwater Discharge Permit
- Impoundment with fish passage
- Impoundment
- Road Crossing
- Road Crossing within tidal area
- Impervious Surface

Population Density (persons/ac)

810

0

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HERRING RIVER / HERRING POND ECOLOGICAL STRESSORS

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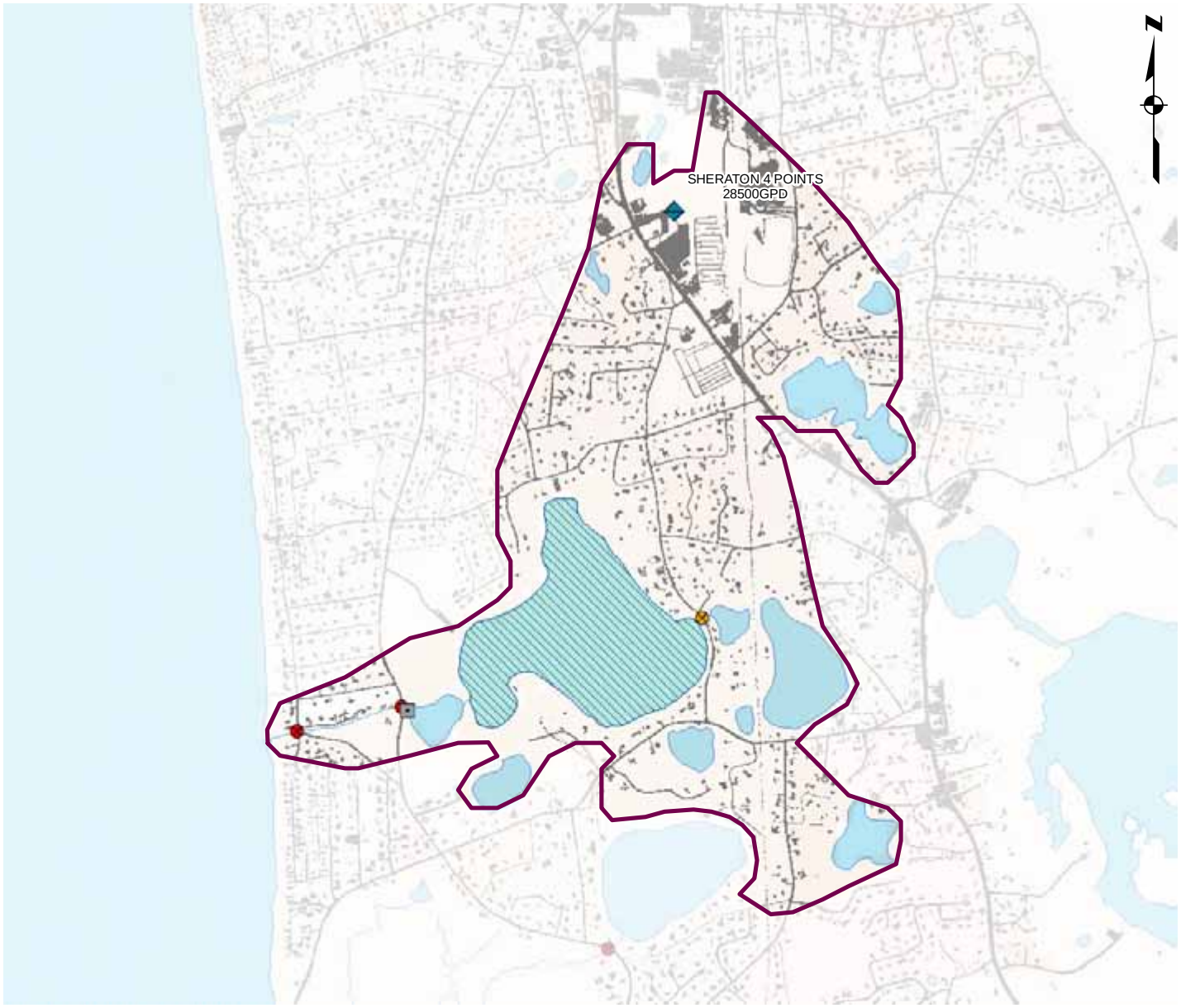

Legend

- Estuarine Watershed Boundary
- 303(d) Impairment for Nutrients (stream)
- 303(d) Impairment for Nutrients (water body)
- 303(d) Impairment for Bacteria (stream)
- 303(d) Impairment for Bacteria (water body)
- Wastewater Treatment Plant Outfall
- Groundwater Discharge Permit
- Impoundment with fish passage
- Impoundment
- Road Crossing
- Road Crossing within tidal area
- Impervious Surface

Population Density (persons/ac)

810

0

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HERRING BROOK / GREAT POND ECOLOGICAL STRESSORS

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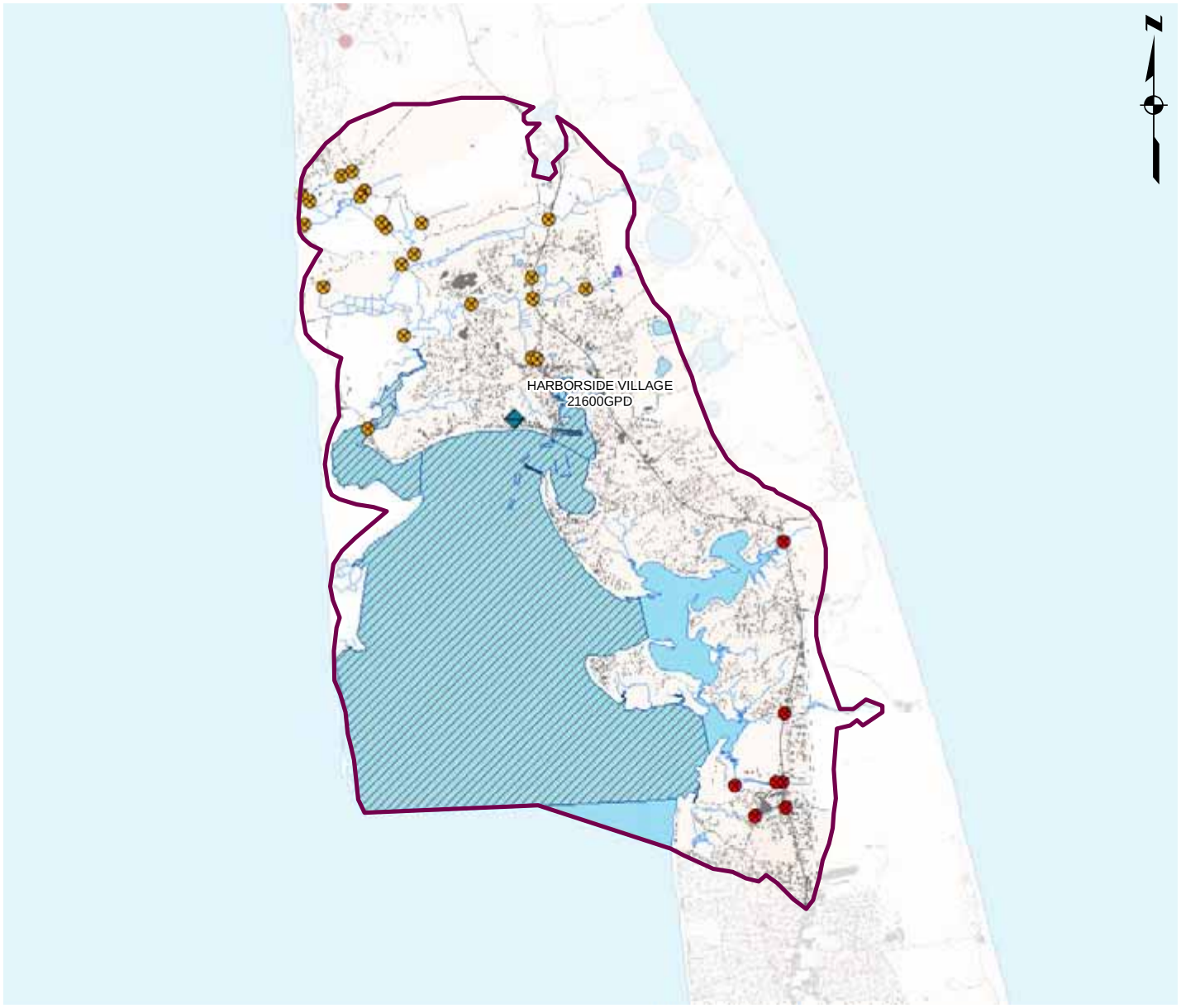

Legend

- Estuarine Watershed Boundary
- 303(d) Impairment for Nutrients (stream)
- 303(d) Impairment for Nutrients (water body)
- 303(d) Impairment for Bacteria (stream)
- 303(d) Impairment for Bacteria (water body)
- Wastewater Treatment Plant Outfall
- Groundwater Discharge Permit
- Impoundment with fish passage
- Impoundment
- Road Crossing
- Road Crossing within tidal area
- Impervious Surface

Population Density (persons/ac)

810

0

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WELLFLEET HARBOR
ECOLOGICAL STRESSORS

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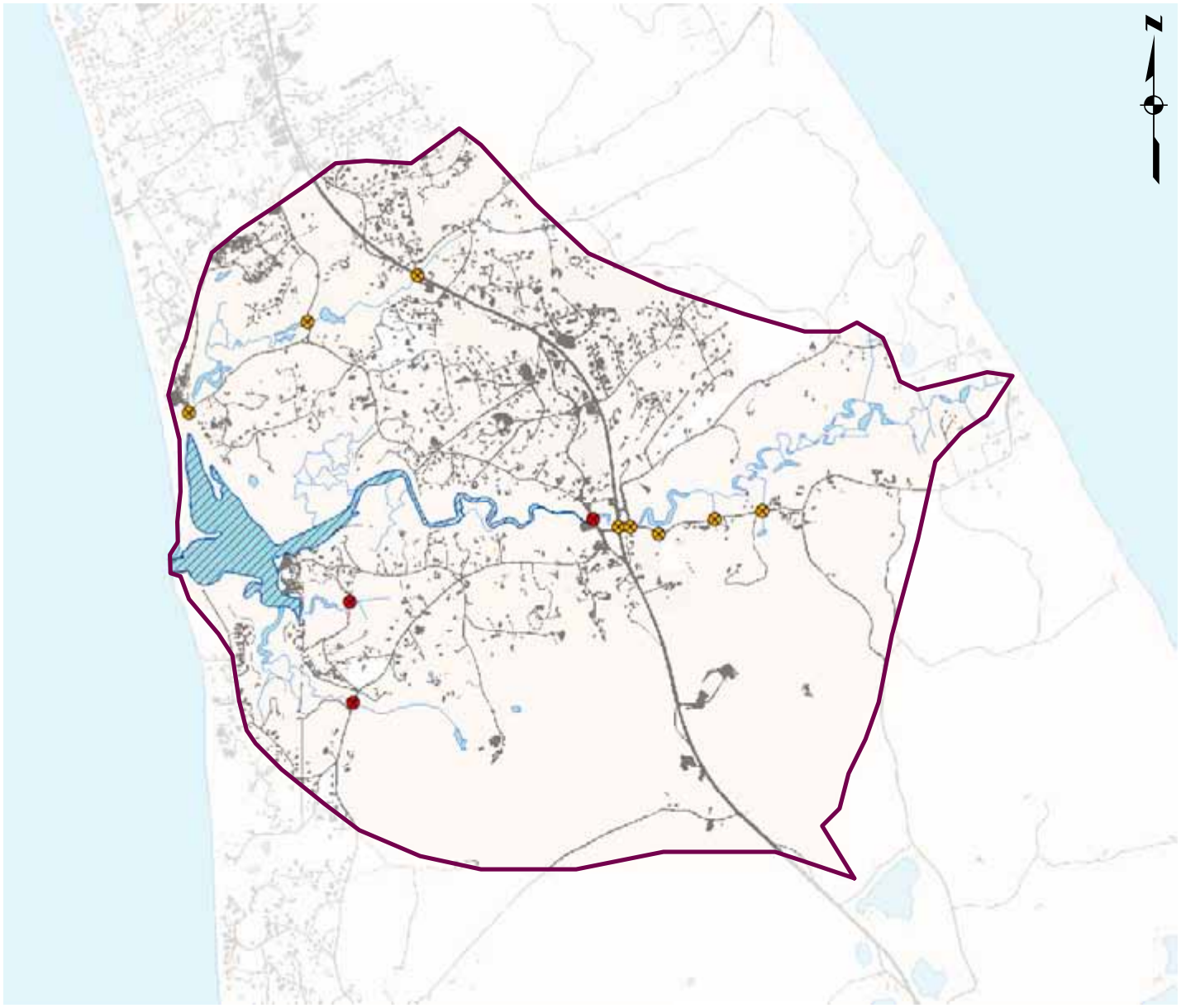

Legend

- Estuarine Watershed Boundary
- 303(d) Impairment for Nutrients (stream)
- 303(d) Impairment for Nutrients (water body)
- 303(d) Impairment for Bacteria (stream)
- 303(d) Impairment for Bacteria (water body)
- Wastewater Treatment Plant Outfall
- Groundwater Discharge Permit
- Impoundment with fish passage
- Impoundment
- Road Crossing
- Road Crossing within tidal area
- Impervious Surface

Population Density (persons/ac)

- 810
- 0

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PAMET RIVER / LITTLE PAMET RIVER
ECOLOGICAL STRESSORS

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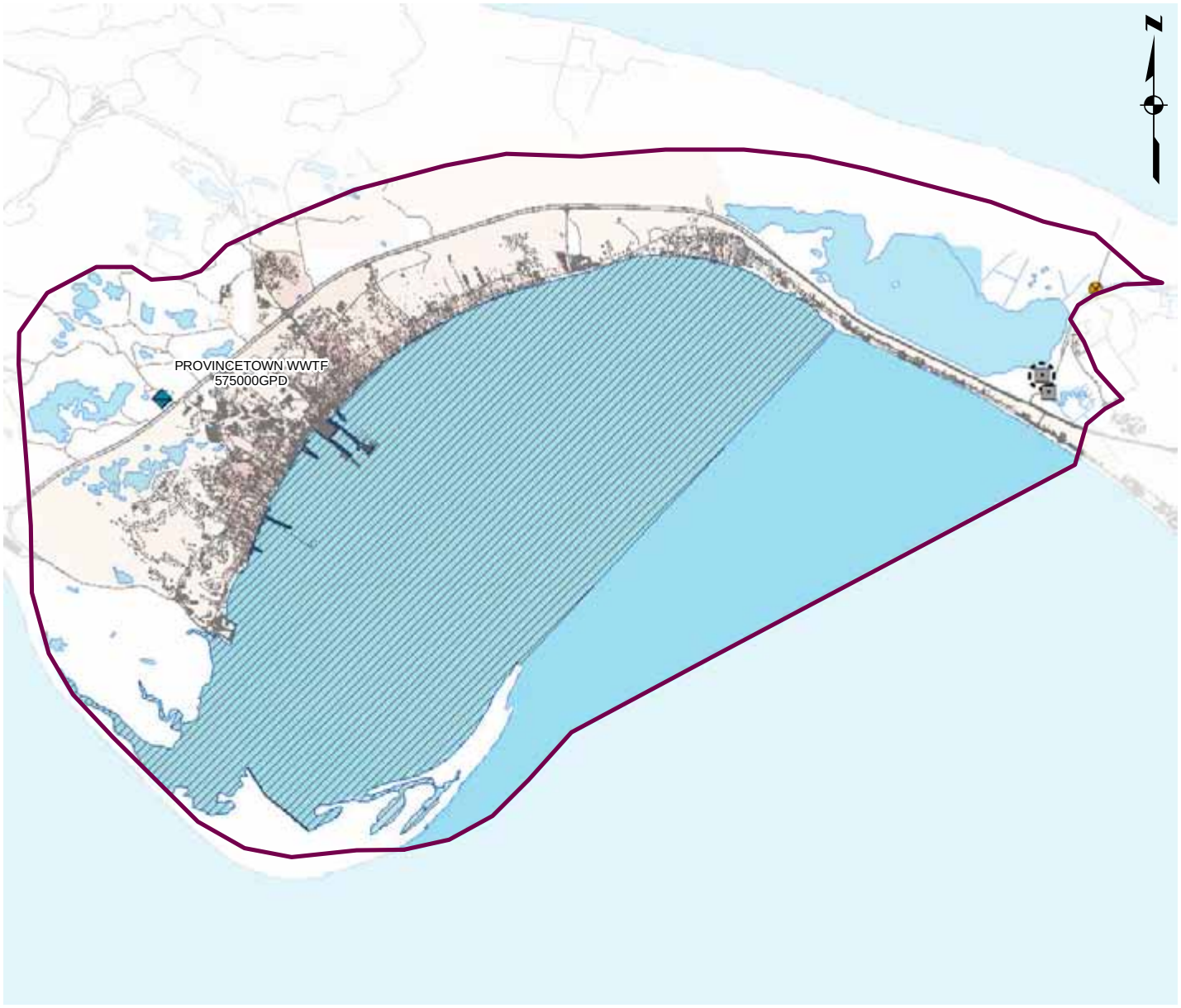

Legend

- Estuarine Watershed Boundary
- 303(d) Impairment for Nutrients (stream)
- 303(d) Impairment for Nutrients (water body)
- 303(d) Impairment for Bacteria (stream)
- 303(d) Impairment for Bacteria (water body)
- Wastewater Treatment Plant Outfall
- Groundwater Discharge Permit
- Impoundment with fish passage
- Impoundment
- Road Crossing
- Road Crossing within tidal area
- Impervious Surface

Population Density (persons/ac)

810

0

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PROVINCETOWN HARBOR ECOLOGICAL STRESSORS

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APPENDIX D

MAPS, RESOURCE INDICATORS

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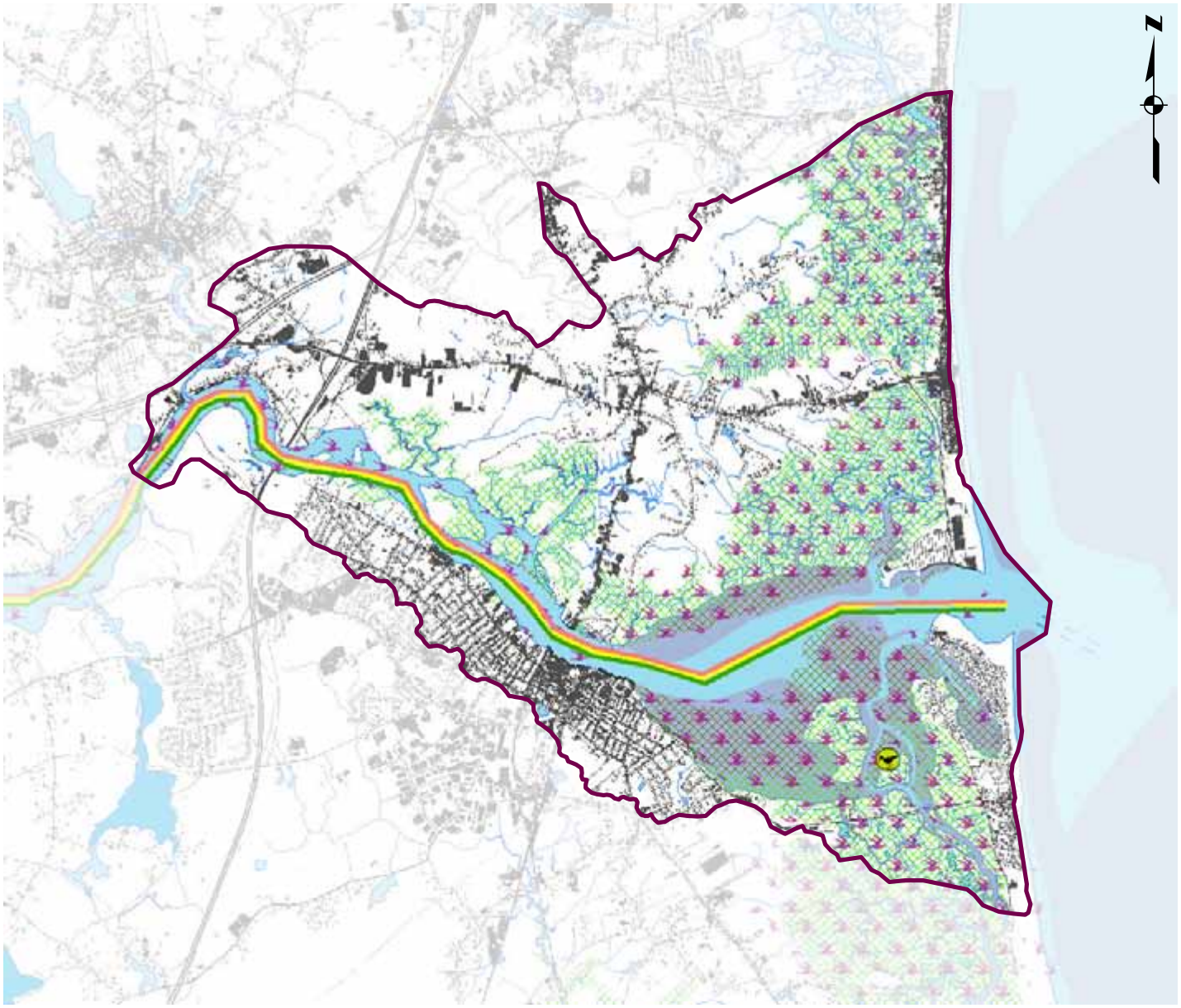

Legend

- Estuarine Watershed Boundary
- Salt Marsh
- Tidal Flat
- Shellfish Suitability Areas
- Shorebird Nesting Site
- Shorebird Habitat
- Seagrass Extent

Anadromous Fish Run

- Alewife
- Atlantic Sturgeon
- Blueback Herring
- Rainbow Smelt
- Shad

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MERRIMACK RIVER / BLACK ROCK CREEK ESTUARINE RESOURCES

Map 1 of 47

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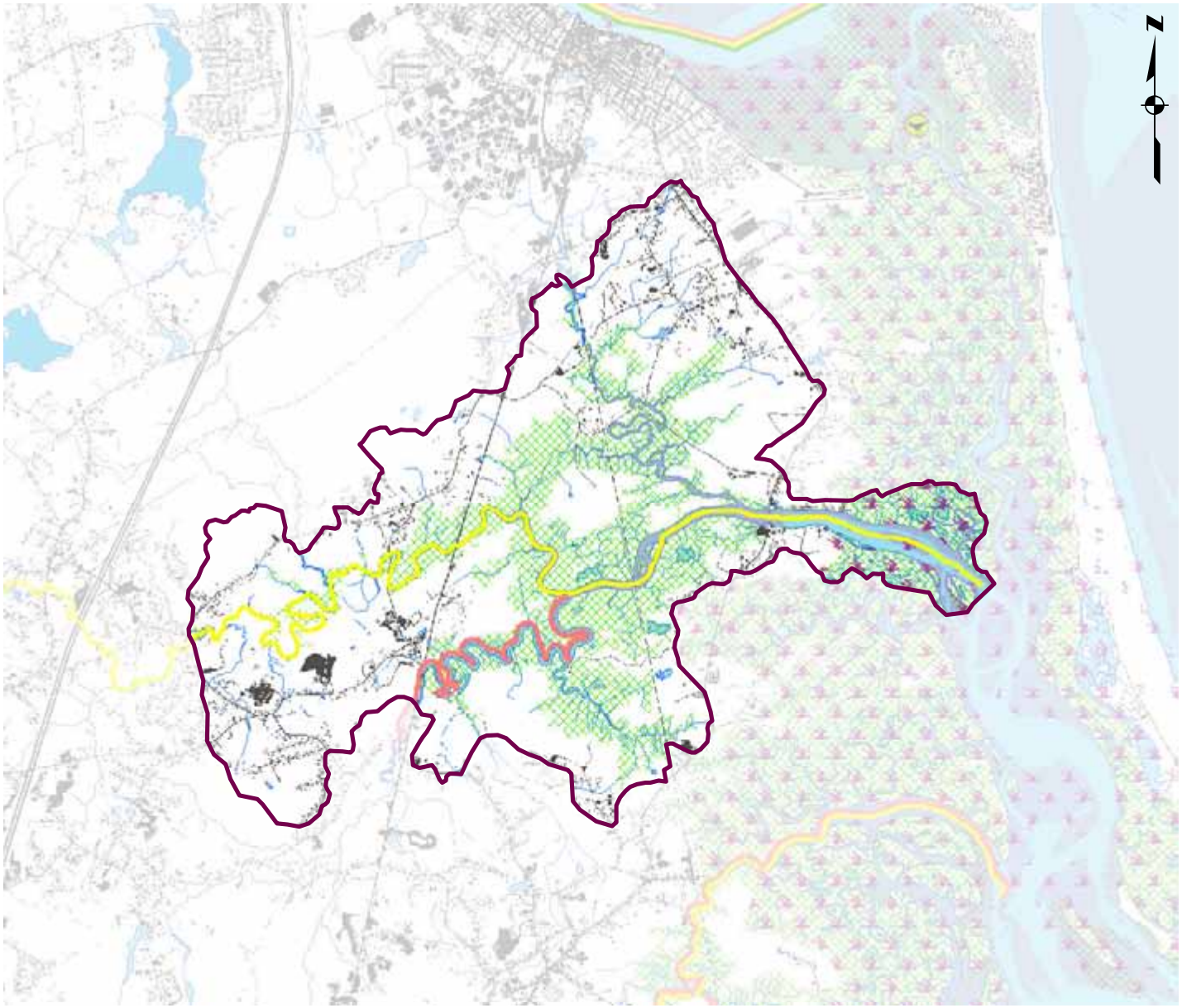

Legend

- Estuarine Watershed Boundary
- Salt Marsh
- Tidal Flat
- Shellfish Suitability Areas
- Shorebird Nesting Site
- Shorebird Habitat
- Seagrass Extent

Anadromous Fish Run

- Alewife
- Atlantic Sturgeon
- Blueback Herring
- Rainbow Smelt
- Shad

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PARKER RIVER ESTUARINE RESOURCES

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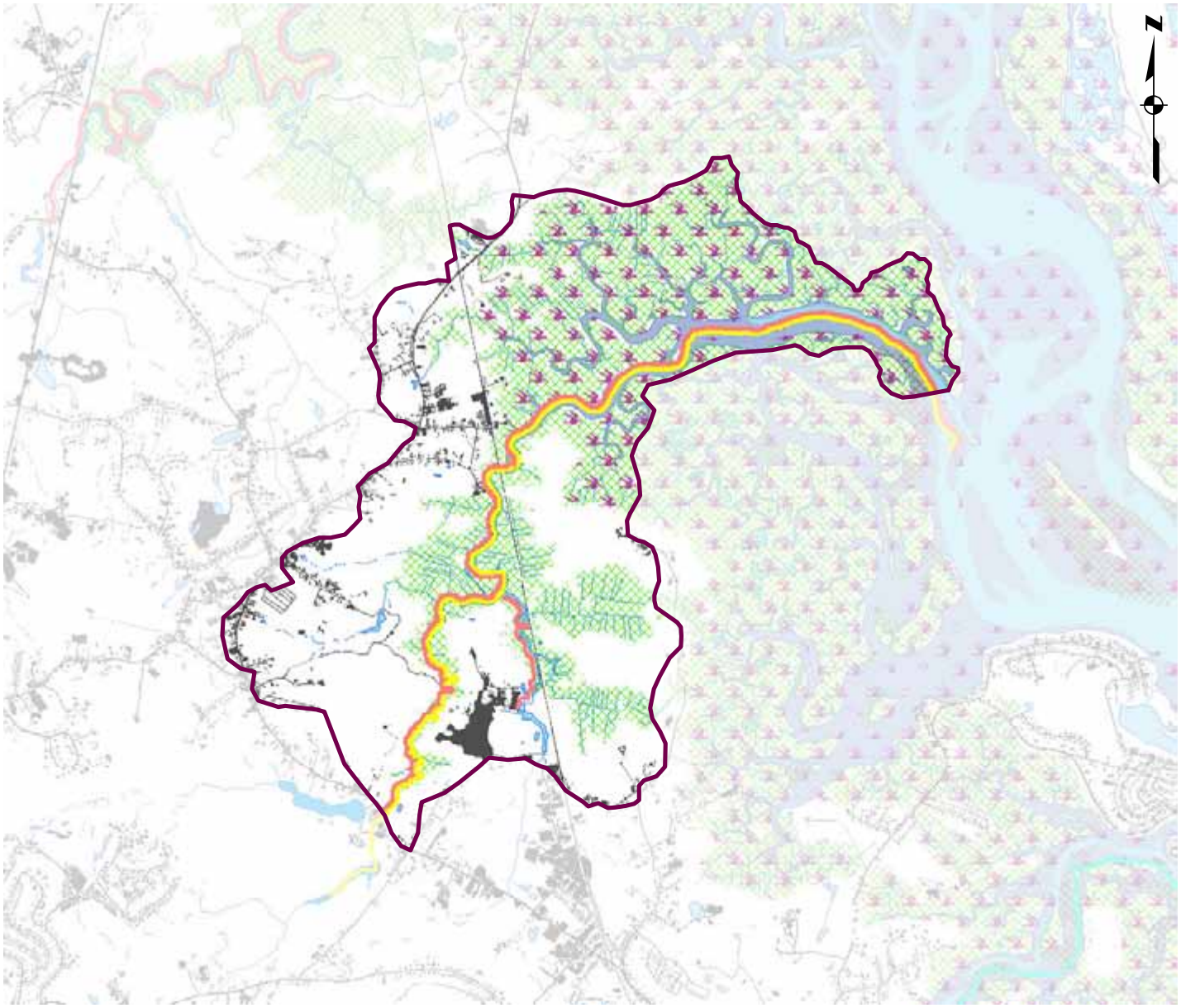

Legend

- Estuarine Watershed Boundary
- Salt Marsh
- Tidal Flat
- Shellfish Suitability Areas
- Shorebird Nesting Site
- Shorebird Habitat
- Seagrass Extent

Anadromous Fish Run

- Alewife
- Atlantic Sturgeon
- Blueback Herring
- Rainbow Smelt
- Shad

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ROWLEY RIVER ESTUARINE RESOURCES

Map 3 of 47

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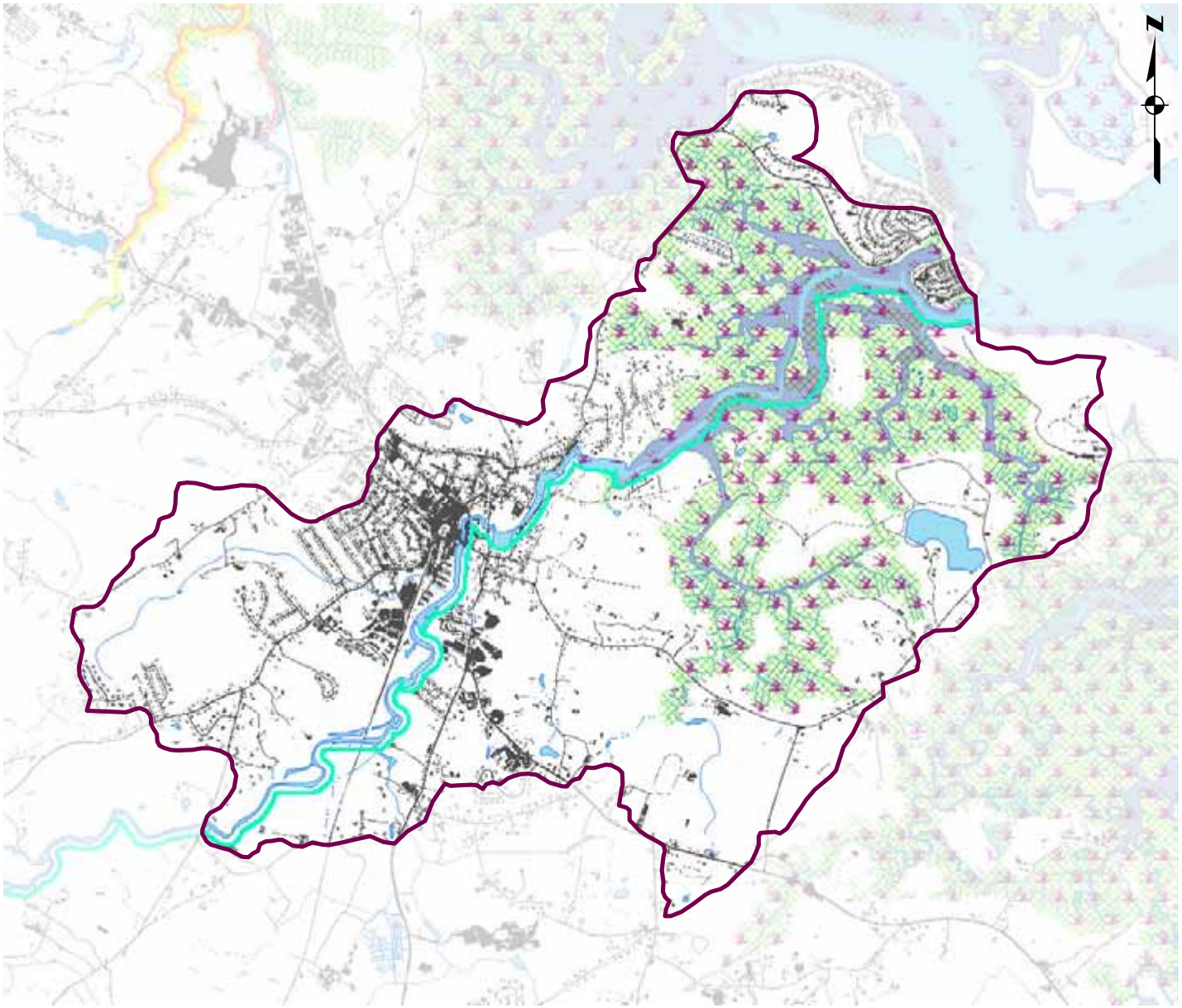

Legend

- Estuarine Watershed Boundary
- Salt Marsh
- Tidal Flat
- Shellfish Suitability Areas
- Shorebird Nesting Site
- Shorebird Habitat
- Seagrass Extent

Anadromous Fish Run

- Alewife
- Atlantic Sturgeon
- Blueback Herring
- Rainbow Smelt
- Shad

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IPSWICH RIVER ESTUARINE RESOURCES

Map 4 of 47

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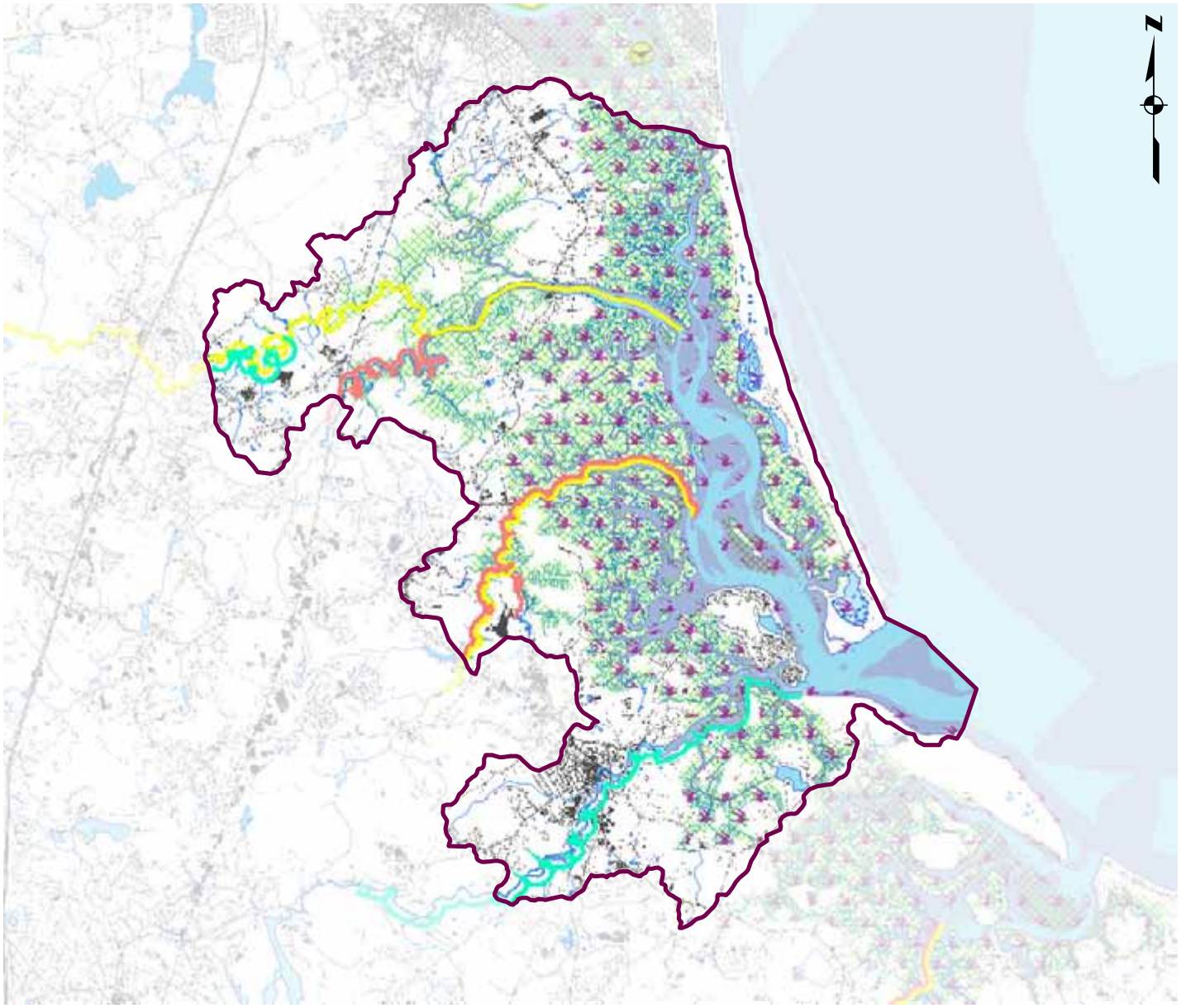

Legend

- Estuarine Watershed Boundary
- Salt Marsh
- Tidal Flat
- Shellfish Suitability Areas
- Shorebird Nesting Site
- Shorebird Habitat
- Seagrass Extent

Anadromous Fish Run

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- Atlantic Sturgeon
- Blueback Herring
- Rainbow Smelt
- Shad

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PLUM ISLAND SOUND ESTUARINE RESOURCES

Map 5 of 47

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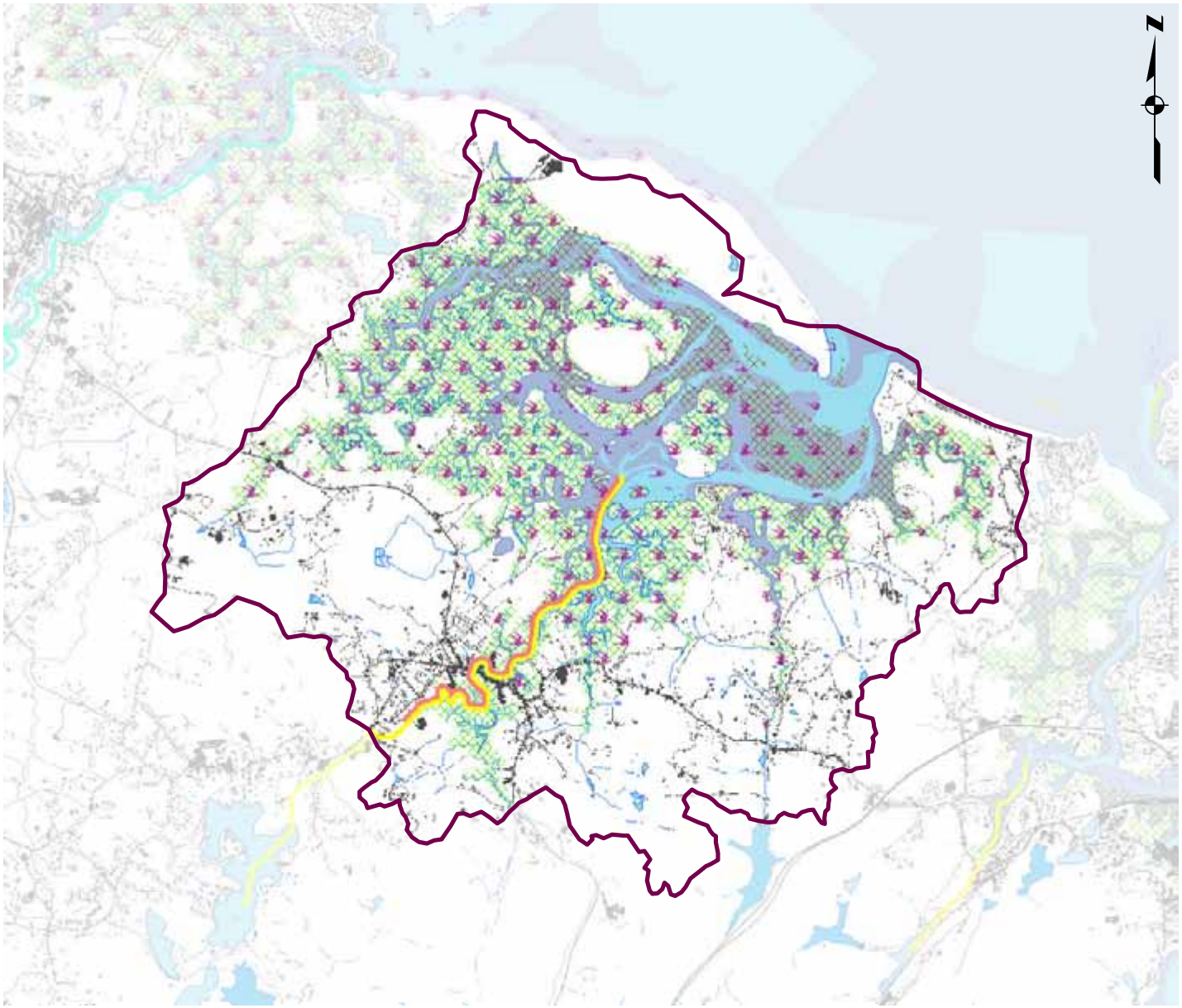

Legend

- Estuarine Watershed Boundary
- Salt Marsh
- Tidal Flat
- Shellfish Suitability Areas
- Shorebird Nesting Site
- Shorebird Habitat
- Seagrass Extent

Anadromous Fish Run

- Alewife
- Atlantic Sturgeon
- Blueback Herring
- Rainbow Smelt
- Shad

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ESSEX RIVER / ESSEX BAY
ESTUARINE RESOURCES

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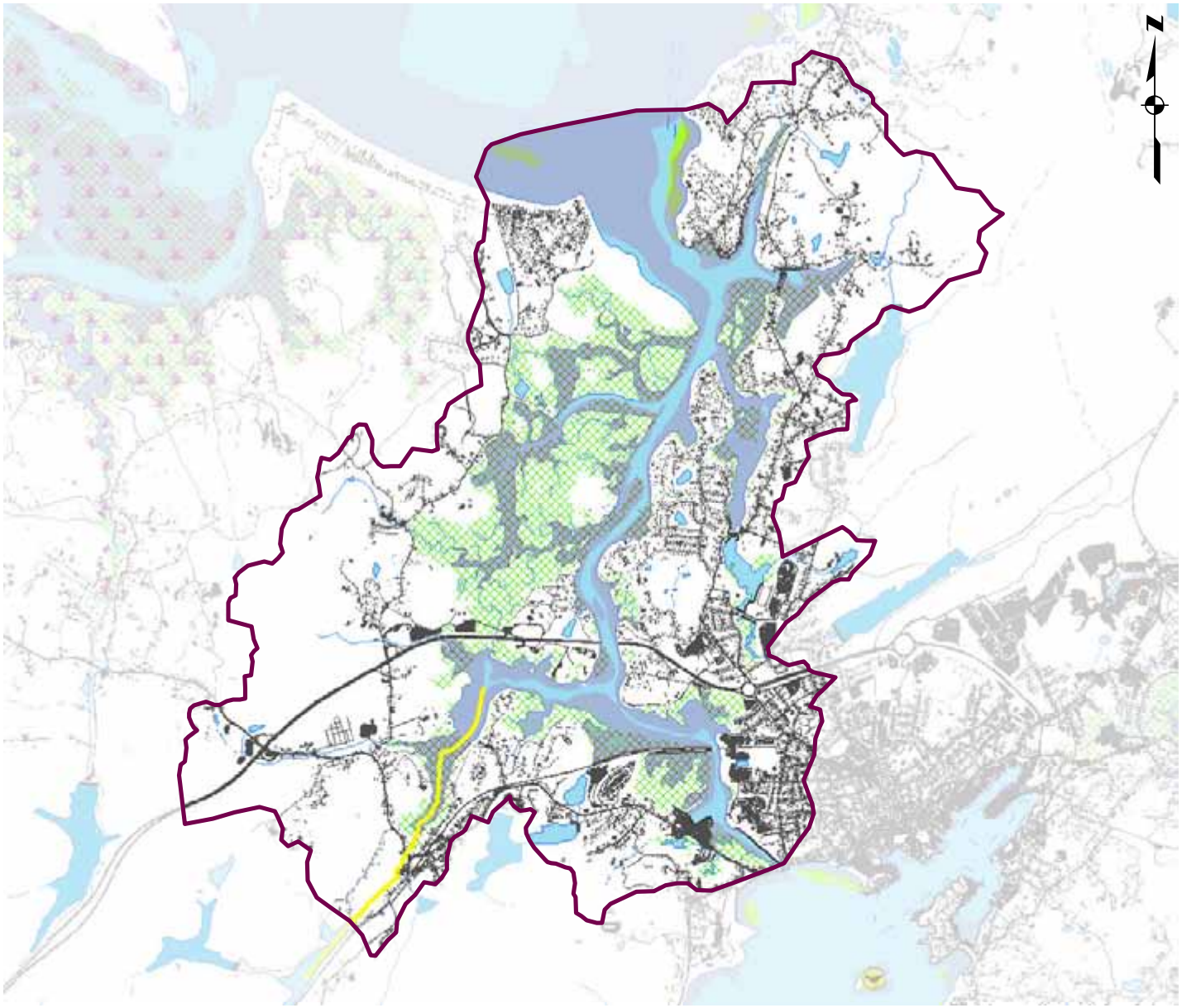

Legend

- Estuarine Watershed Boundary
- Salt Marsh
- Tidal Flat
- Shellfish Suitability Areas
- Shorebird Nesting Site
- Shorebird Habitat
- Seagrass Extent

Anadromous Fish Run

- Alewife
- Atlantic Sturgeon
- Blueback Herring
- Rainbow Smelt
- Shad

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ANNISQUAM RIVER ESTUARINE RESOURCES

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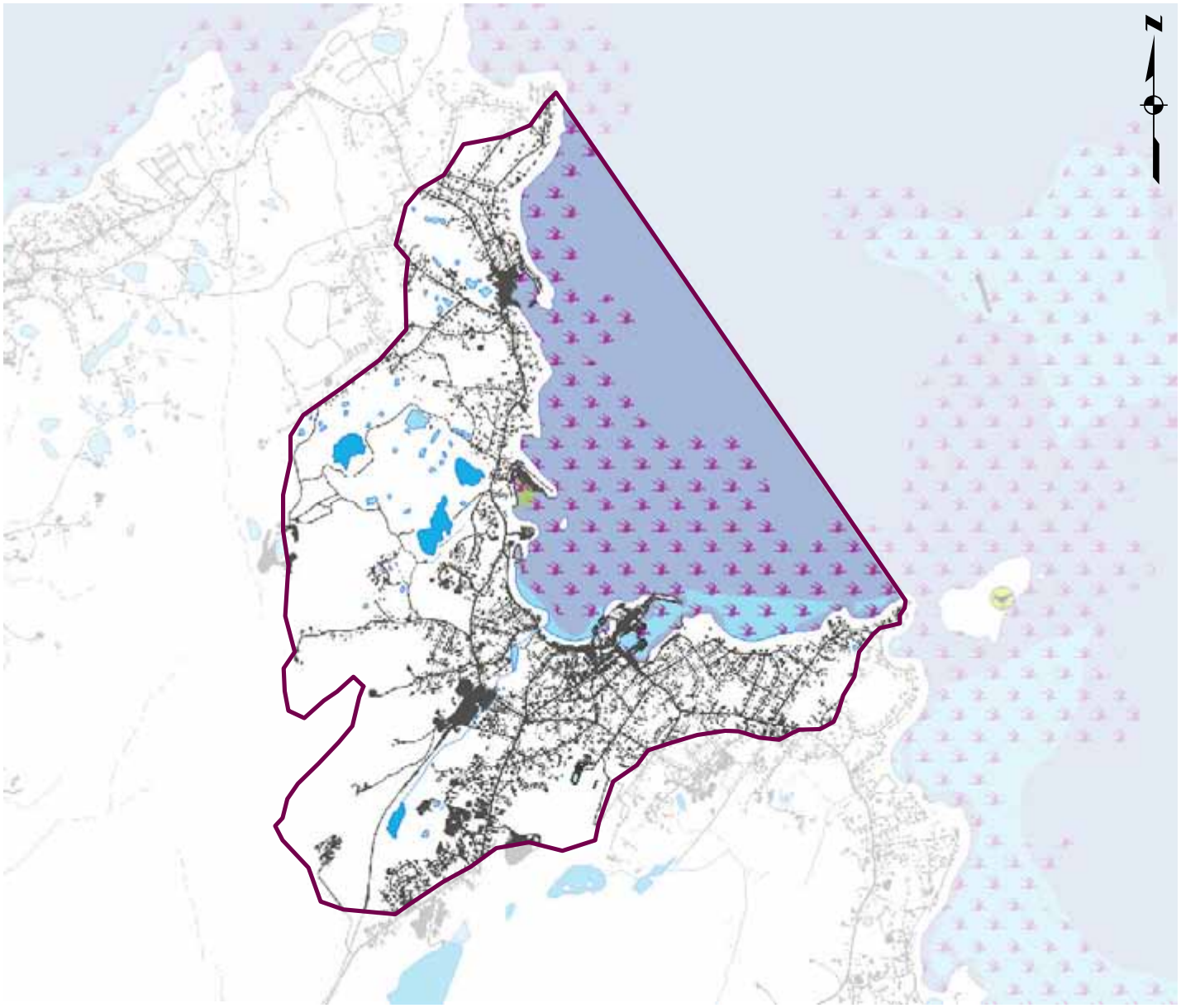

Legend

- Estuarine Watershed Boundary
- Salt Marsh
- Tidal Flat
- Shellfish Suitability Areas
- Shorebird Nesting Site
- Shorebird Habitat
- Seagrass Extent

Anadromous Fish Run

- Alewife
- Atlantic Sturgeon
- Blueback Herring
- Rainbow Smelt
- Shad

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ROCKPORT HARBOR (SANDY BAY) ESTUARINE RESOURCES

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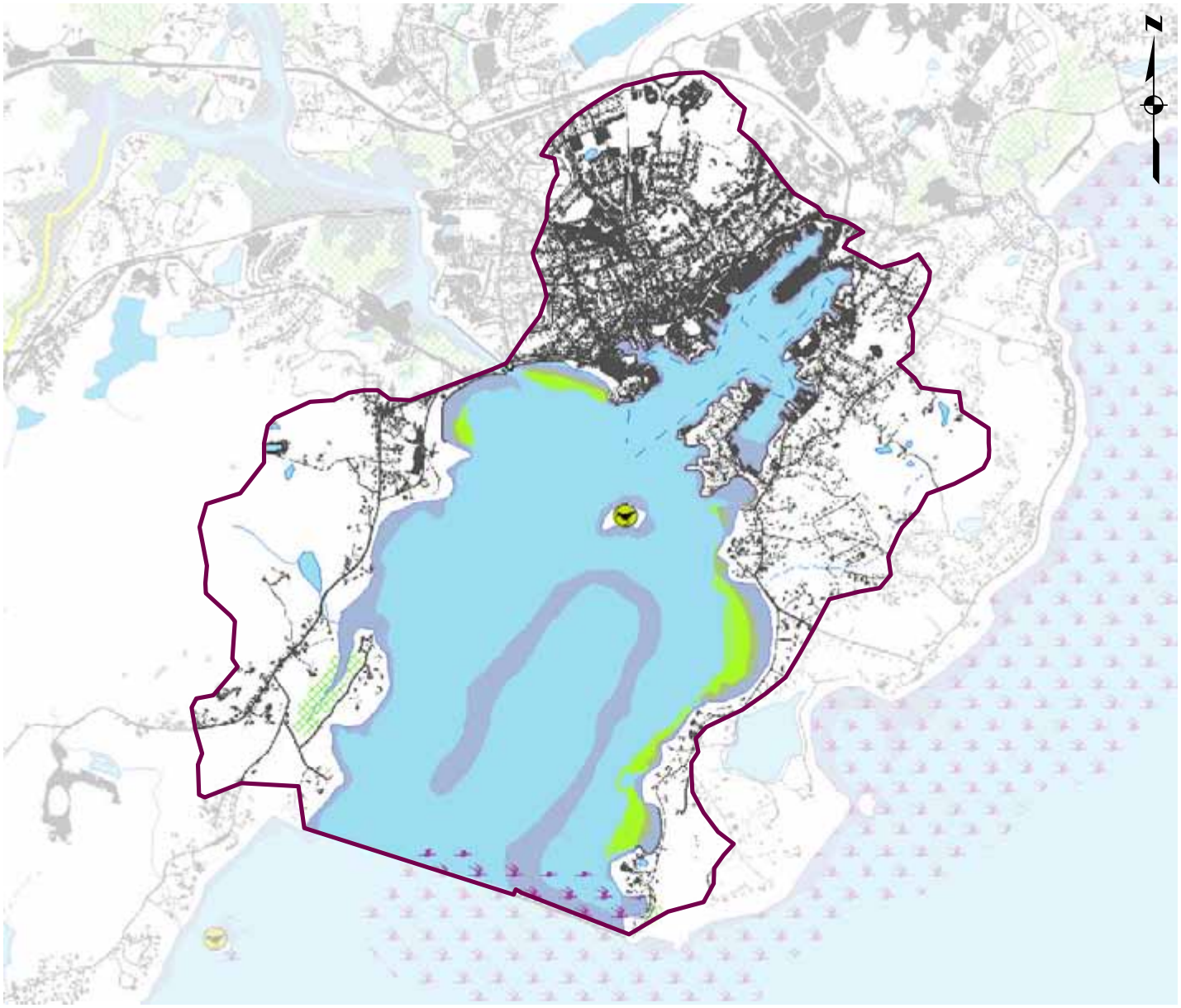

Legend

- Estuarine Watershed Boundary
- Salt Marsh
- Tidal Flat
- Shellfish Suitability Areas
- Shorebird Nesting Site
- Shorebird Habitat
- Seagrass Extent

Anadromous Fish Run

- Alewife
- Atlantic Sturgeon
- Blueback Herring
- Rainbow Smelt
- Shad

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GLOUCESTER HARBOR ESTUARINE RESOURCES

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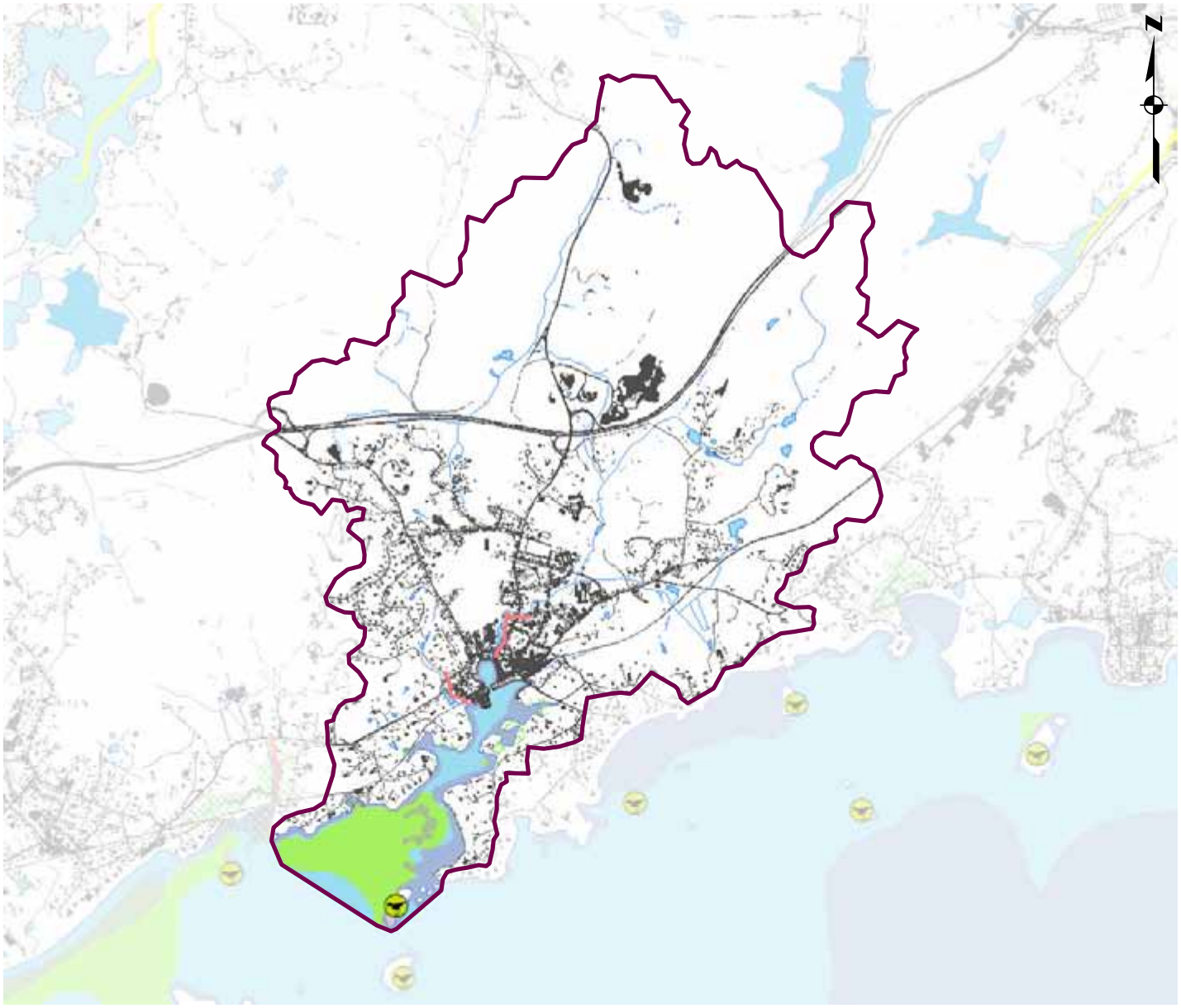

Legend

- Estuarine Watershed Boundary
- Salt Marsh
- Tidal Flat
- Shellfish Suitability Areas
- Shorebird Nesting Site
- Shorebird Habitat
- Seagrass Extent

Anadromous Fish Run

- Alewife
- Atlantic Sturgeon
- Blueback Herring
- Rainbow Smelt
- Shad

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MANCHESTER HARBOR ESTUARINE RESOURCES

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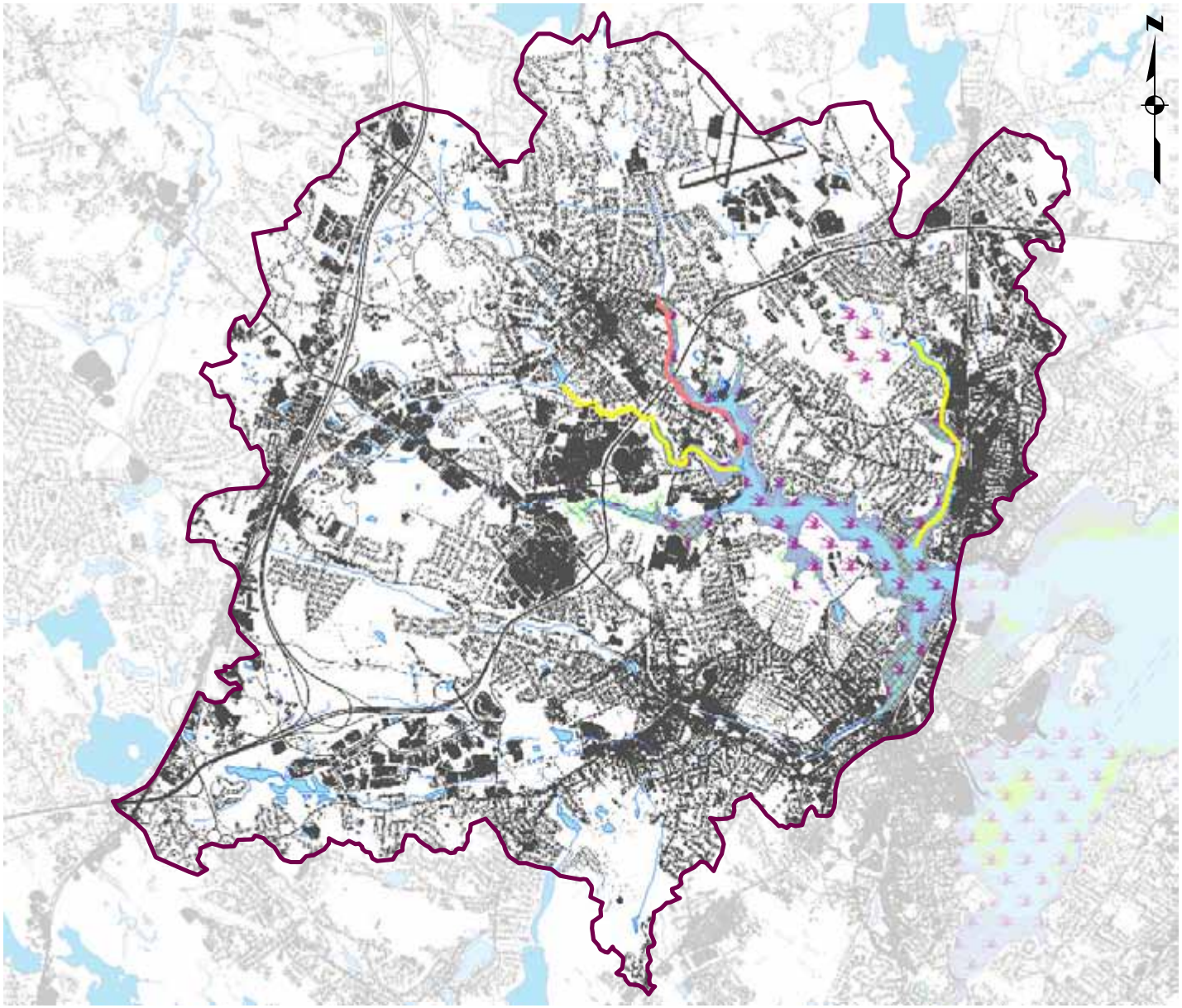

Legend

- Estuarine Watershed Boundary
- Salt Marsh
- Tidal Flat
- Shellfish Suitability Areas
- Shorebird Nesting Site
- Shorebird Habitat
- Seagrass Extent

Anadromous Fish Run

- Alewife
- Atlantic Sturgeon
- Blueback Herring
- Rainbow Smelt
- Shad

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DANVERS RIVER ESTUARINE RESOURCES

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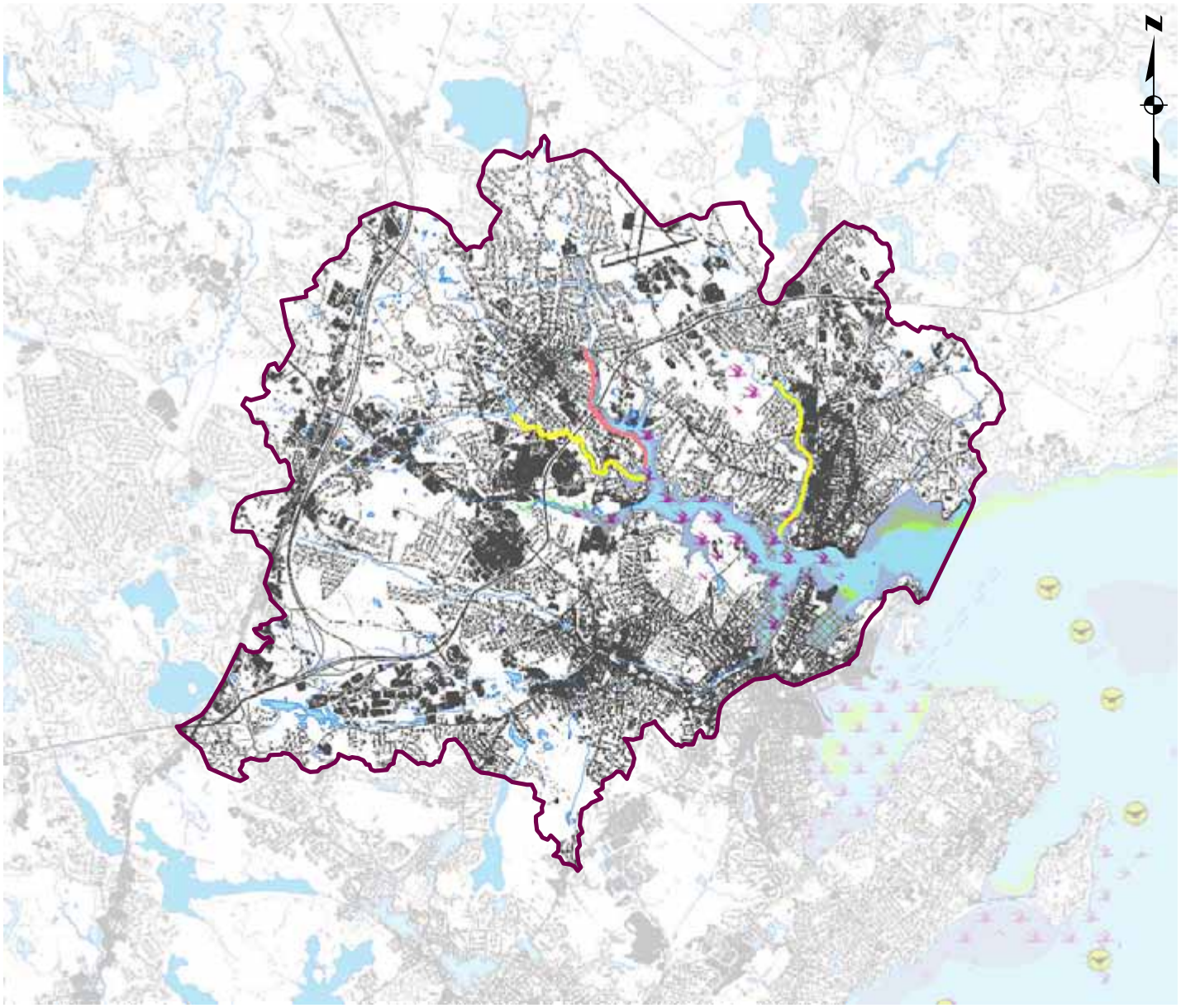

Legend

- Estuarine Watershed Boundary
- Salt Marsh
- Tidal Flat
- Shellfish Suitability Areas
- Shorebird Nesting Site
- Shorebird Habitat
- Seagrass Extent

Anadromous Fish Run

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- Atlantic Sturgeon
- Blueback Herring
- Rainbow Smelt
- Shad

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BEVERLY HARBOR ESTUARINE RESOURCES

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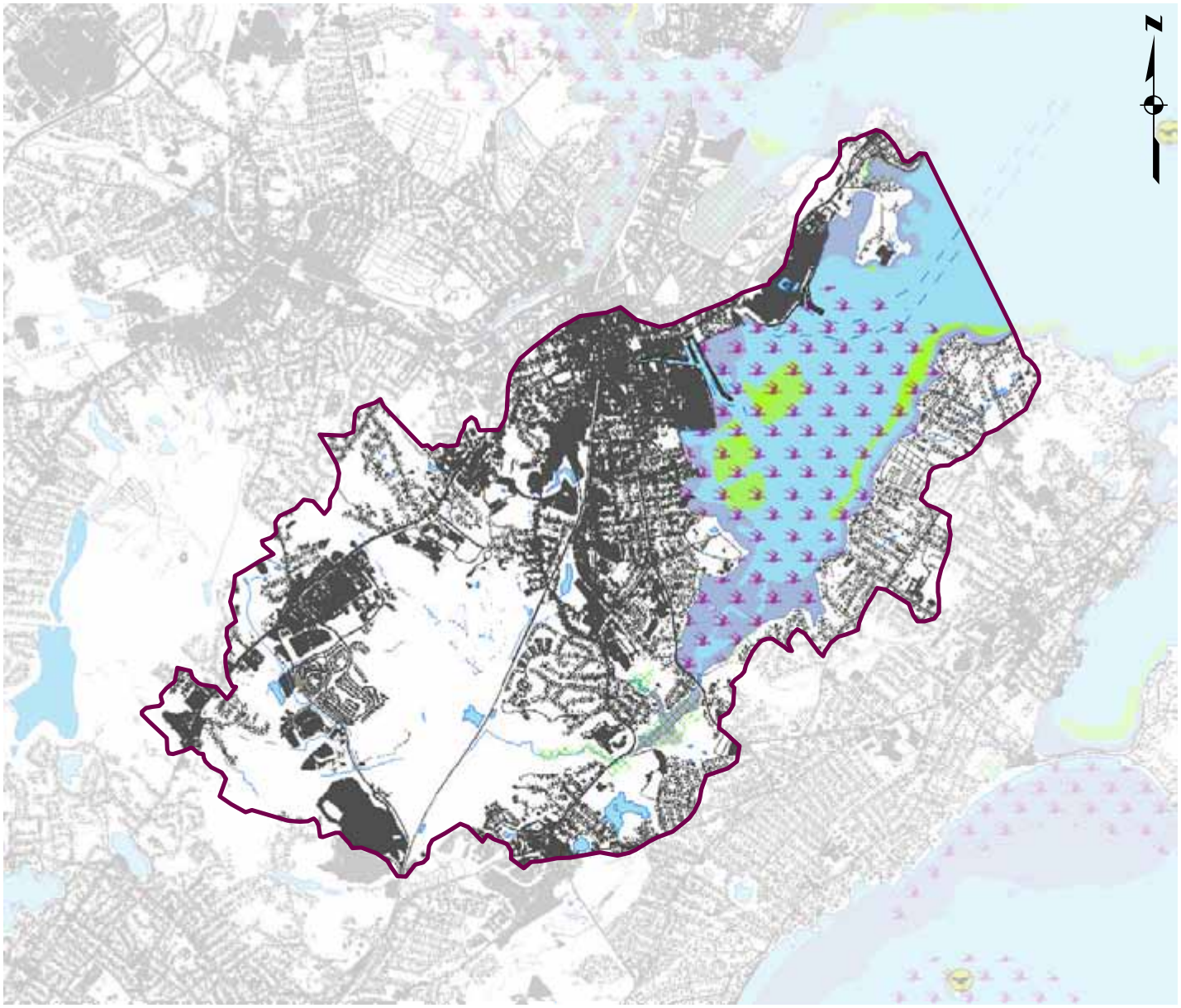

Legend

- Estuarine Watershed Boundary
- Salt Marsh
- Tidal Flat
- Shellfish Suitability Areas
- Shorebird Nesting Site
- Shorebird Habitat
- Seagrass Extent

Anadromous Fish Run

- Alewife
- Atlantic Sturgeon
- Blueback Herring
- Rainbow Smelt
- Shad

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FOREST RIVER / SALEM HARBOR ESTUARINE RESOURCES

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Legend

- Estuarine Watershed Boundary
- Salt Marsh
- Tidal Flat
- Shellfish Suitability Areas
- Shorebird Nesting Site
- Shorebird Habitat
- Seagrass Extent

Anadromous Fish Run

- Alewife
- Atlantic Sturgeon
- Blueback Herring
- Rainbow Smelt
- Shad

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MARBLEHEAD HARBOR ESTUARINE RESOURCES

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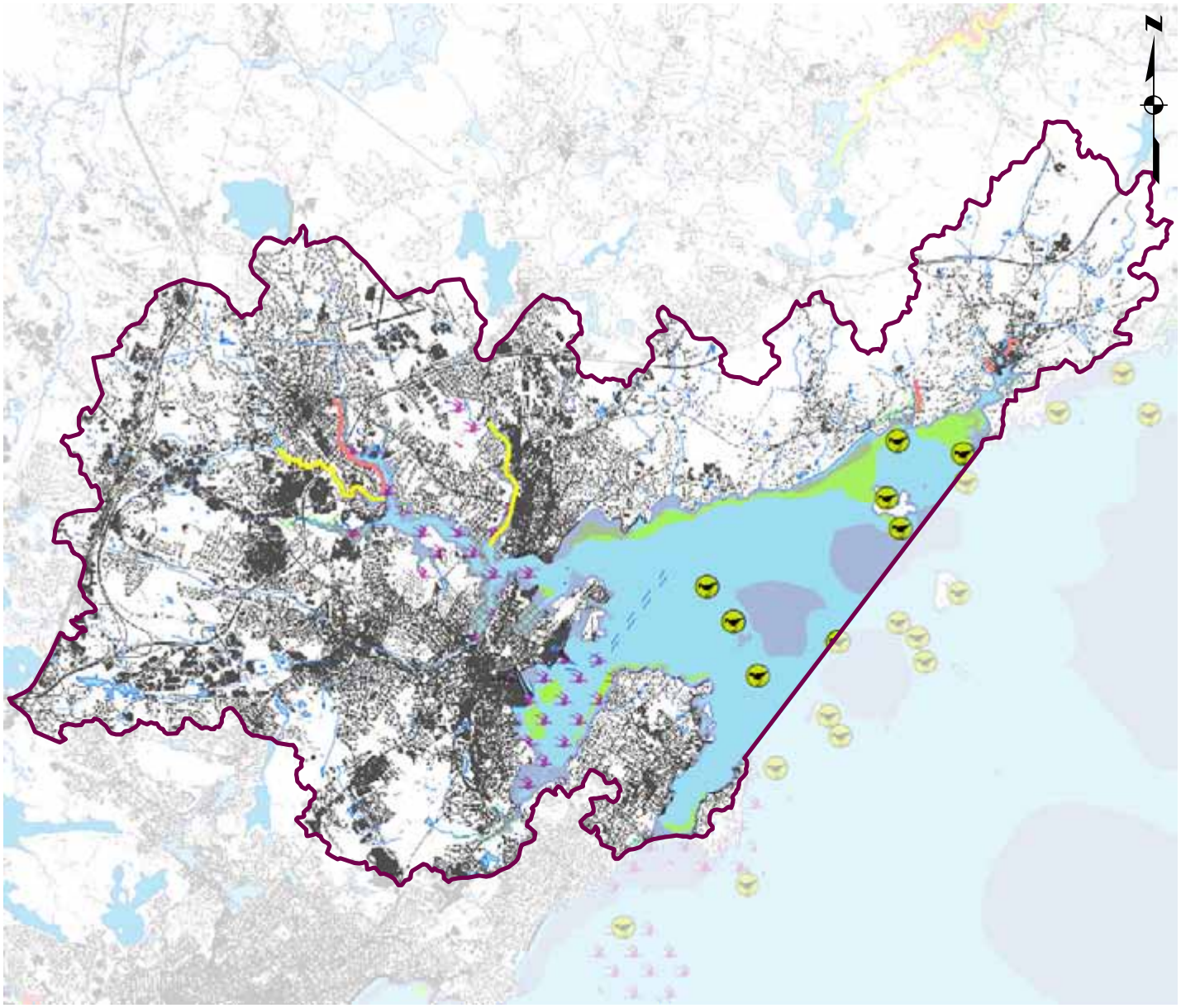

Legend

- Estuarine Watershed Boundary
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Anadromous Fish Run

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SALEM SOUND ESTUARINE RESOURCES

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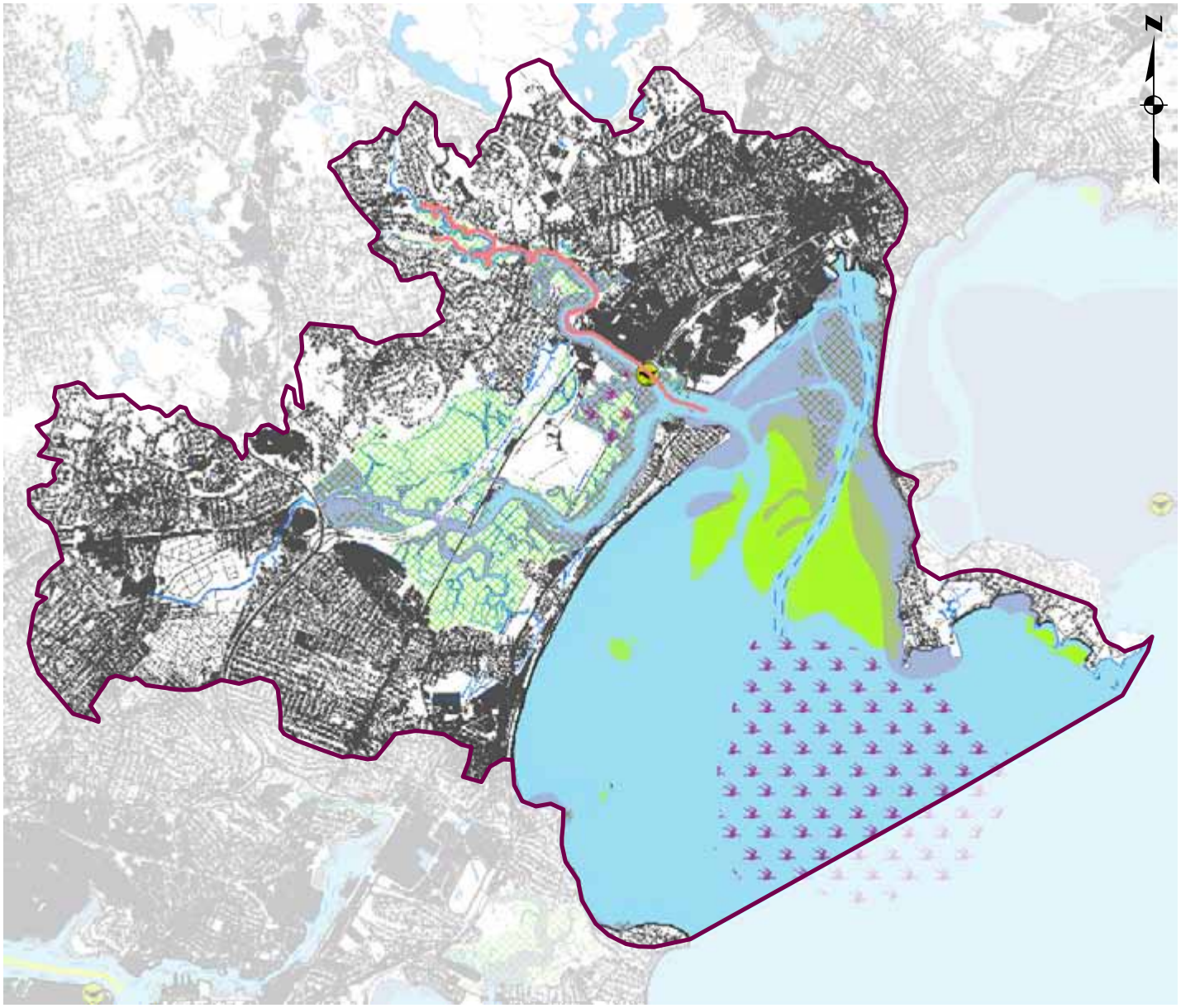

Legend

- Estuarine Watershed Boundary
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Anadromous Fish Run

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SAUGUS RIVER / PINES RIVER / LYNN HARBOR ESTUARINE RESOURCES

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Legend

- Estuarine Watershed Boundary
- Salt Marsh
- Tidal Flat
- Shellfish Suitability Areas
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BELLE ISLE CREEK / WINTHROP BAY ESTUARINE RESOURCES

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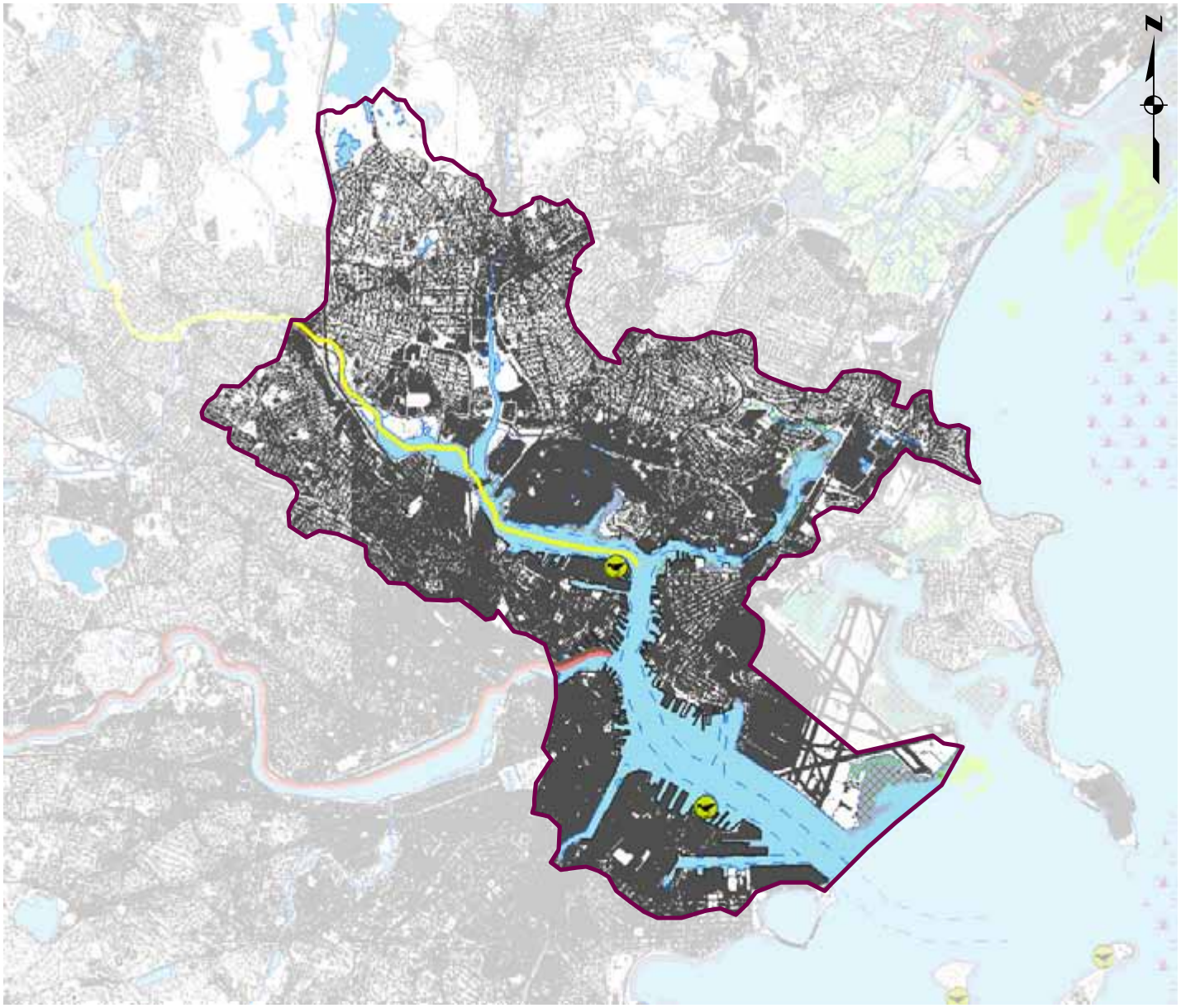

Legend

- Estuarine Watershed Boundary
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CHELSEA CREEK / MYSTIC RIVER / CHARLES RIVER ESTUARINE RESOURCES

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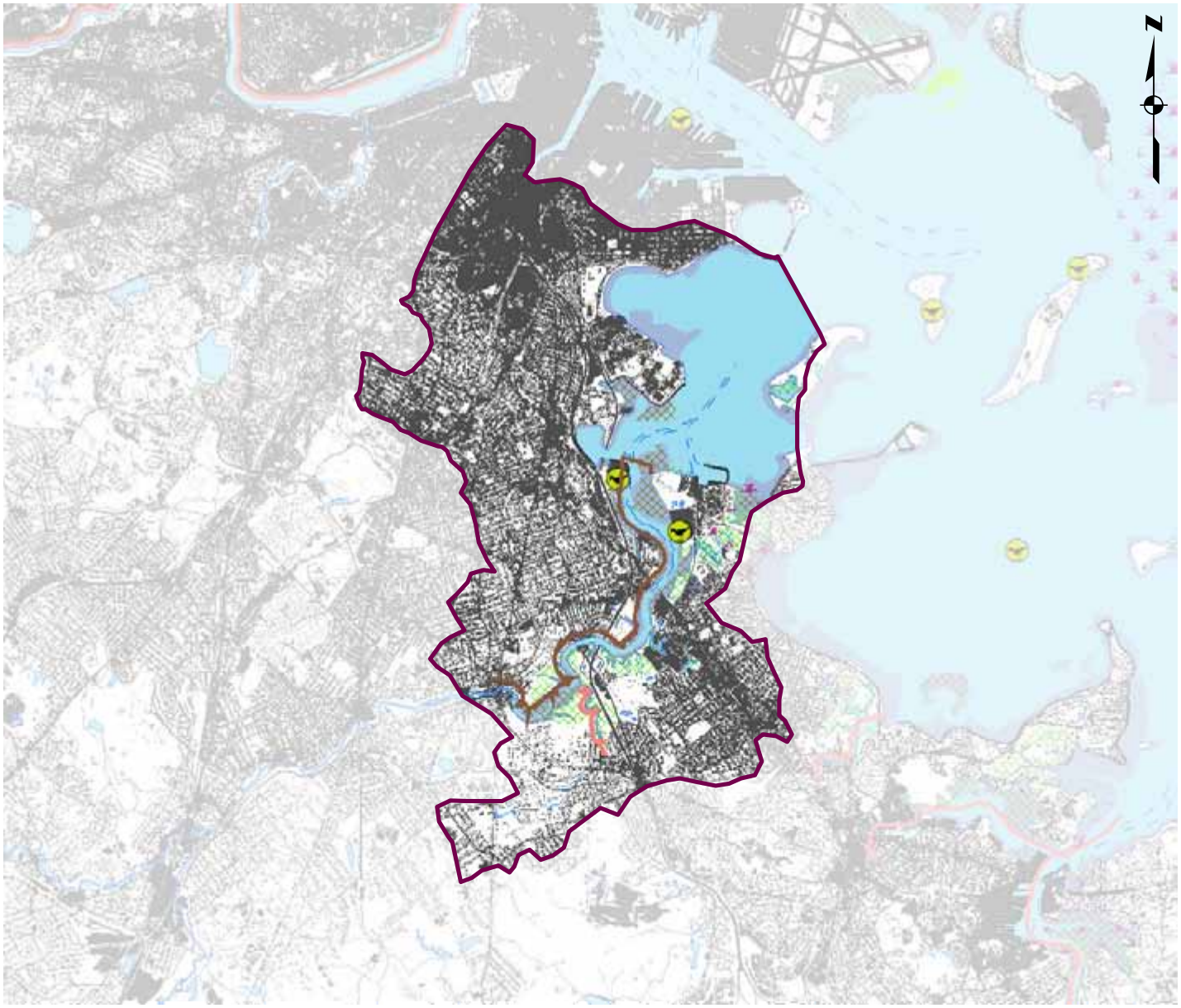

Legend

- Estuarine Watershed Boundary
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NEPONSET RIVER / DORCHESTER BAY ESTUARINE RESOURCES

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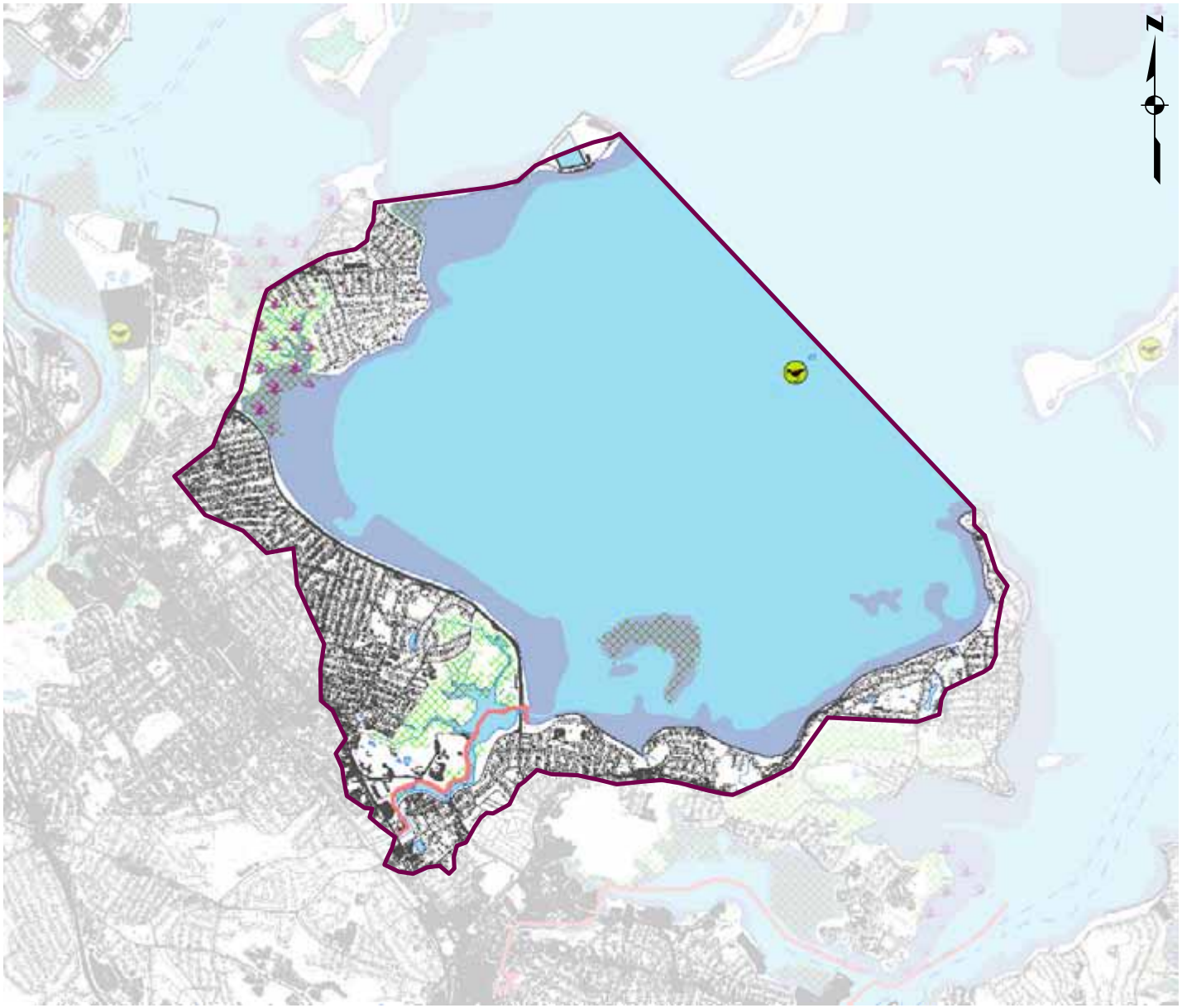

Legend

- Estuarine Watershed Boundary
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BLACKS CREEK / QUINCY BAY ESTUARINE RESOURCES

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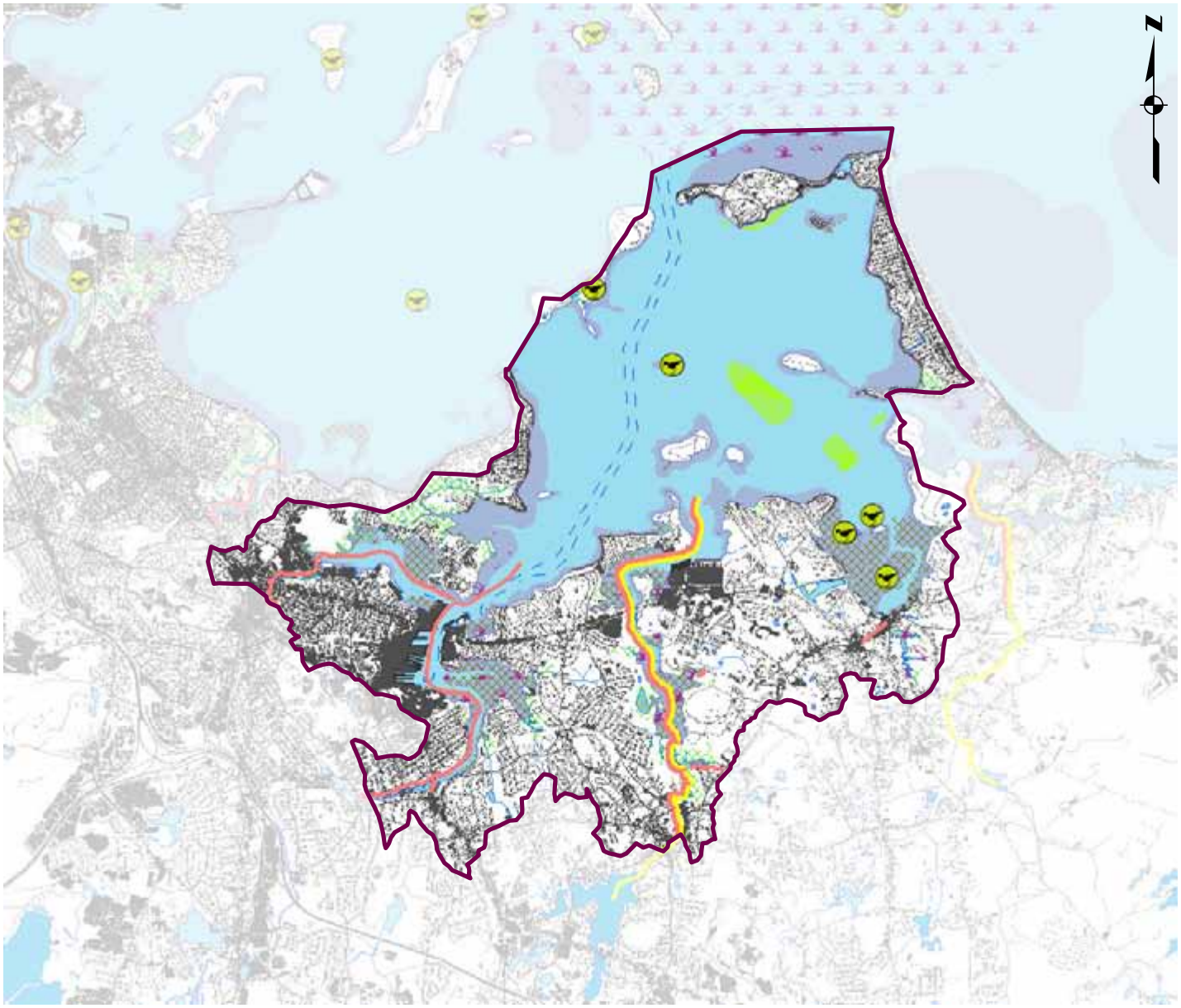

Legend

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BACK RIVER / FORE RIVER / HINGHAM BAY ESTUARINE RESOURCES

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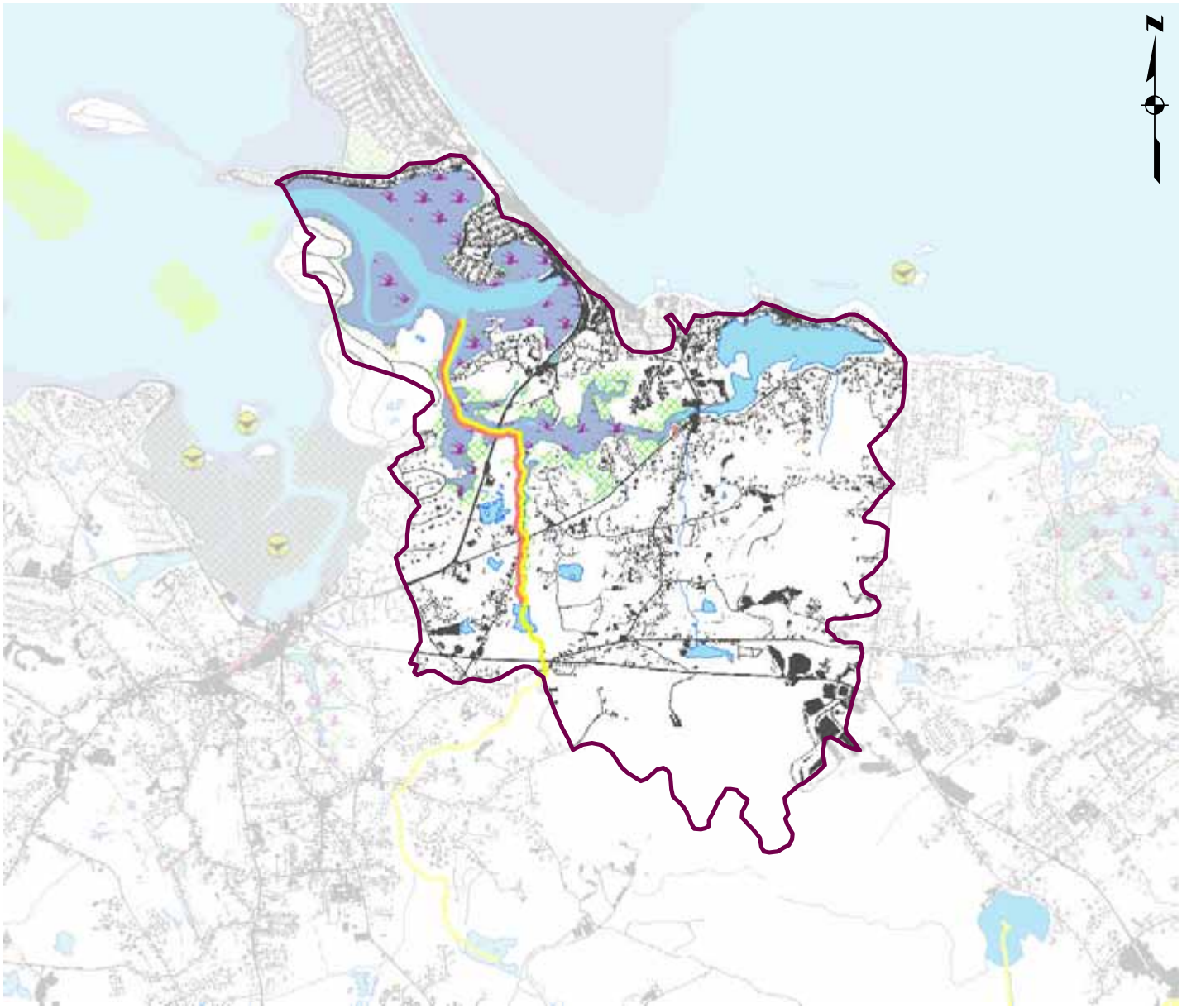

Legend

- Estuarine Watershed Boundary
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WEIR RIVER / STRAITS POND
ESTUARINE RESOURCES

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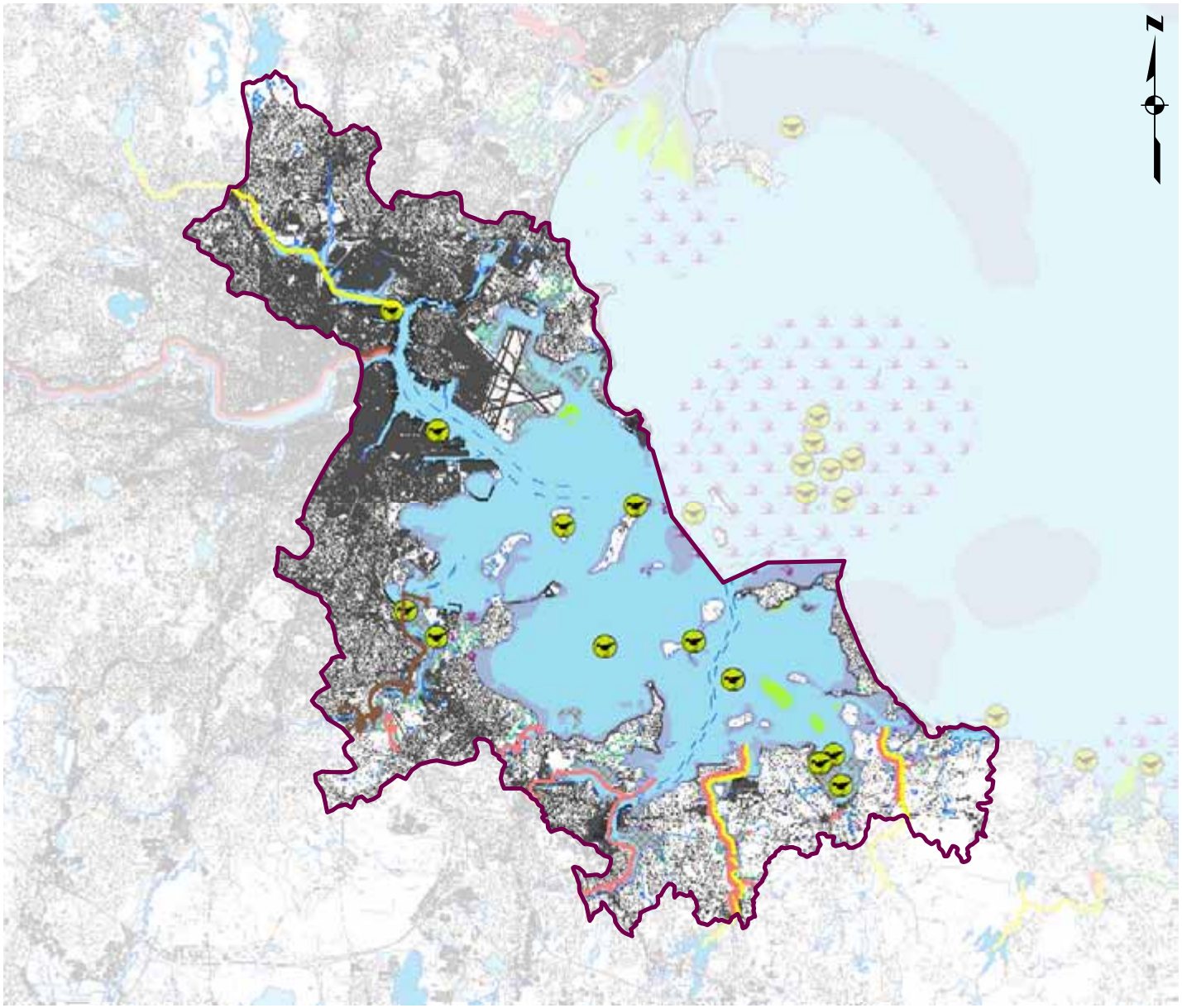

Legend

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BOSTON HARBOR ESTUARINE RESOURCES

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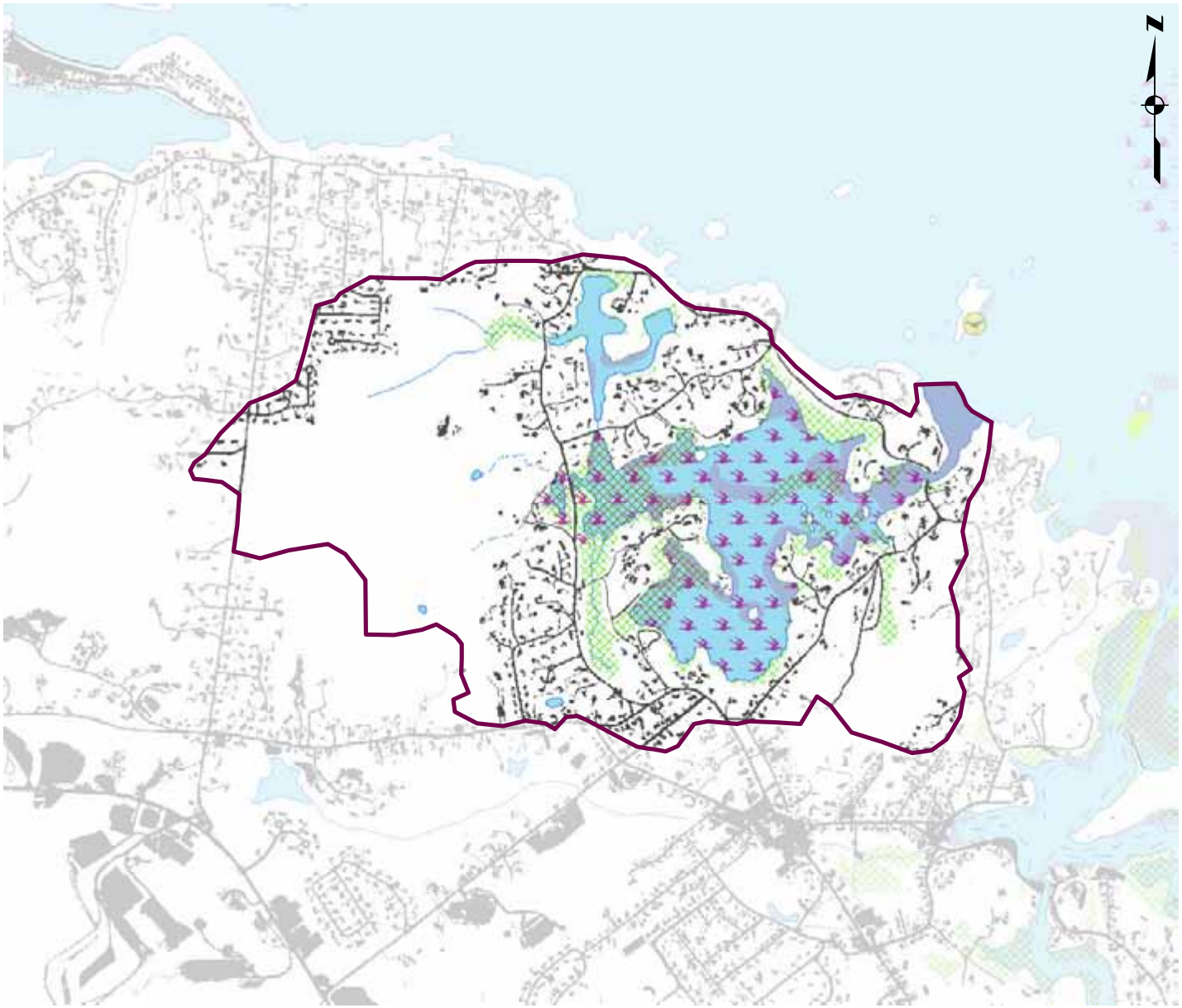

Legend

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LITTLE HARBOR
ESTUARINE RESOURCES

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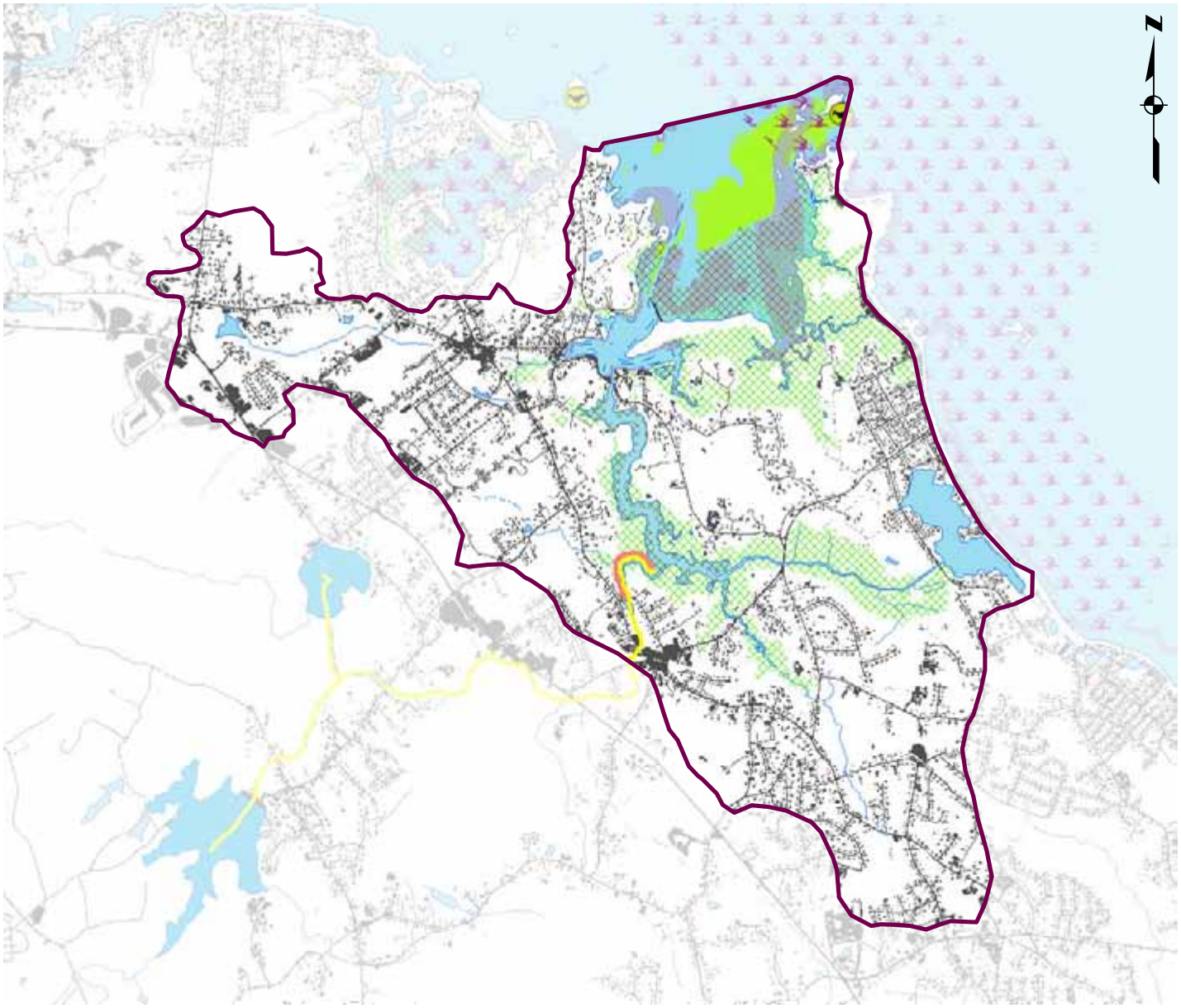

Legend

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COHASSET HARBOR
ESTUARINE RESOURCES

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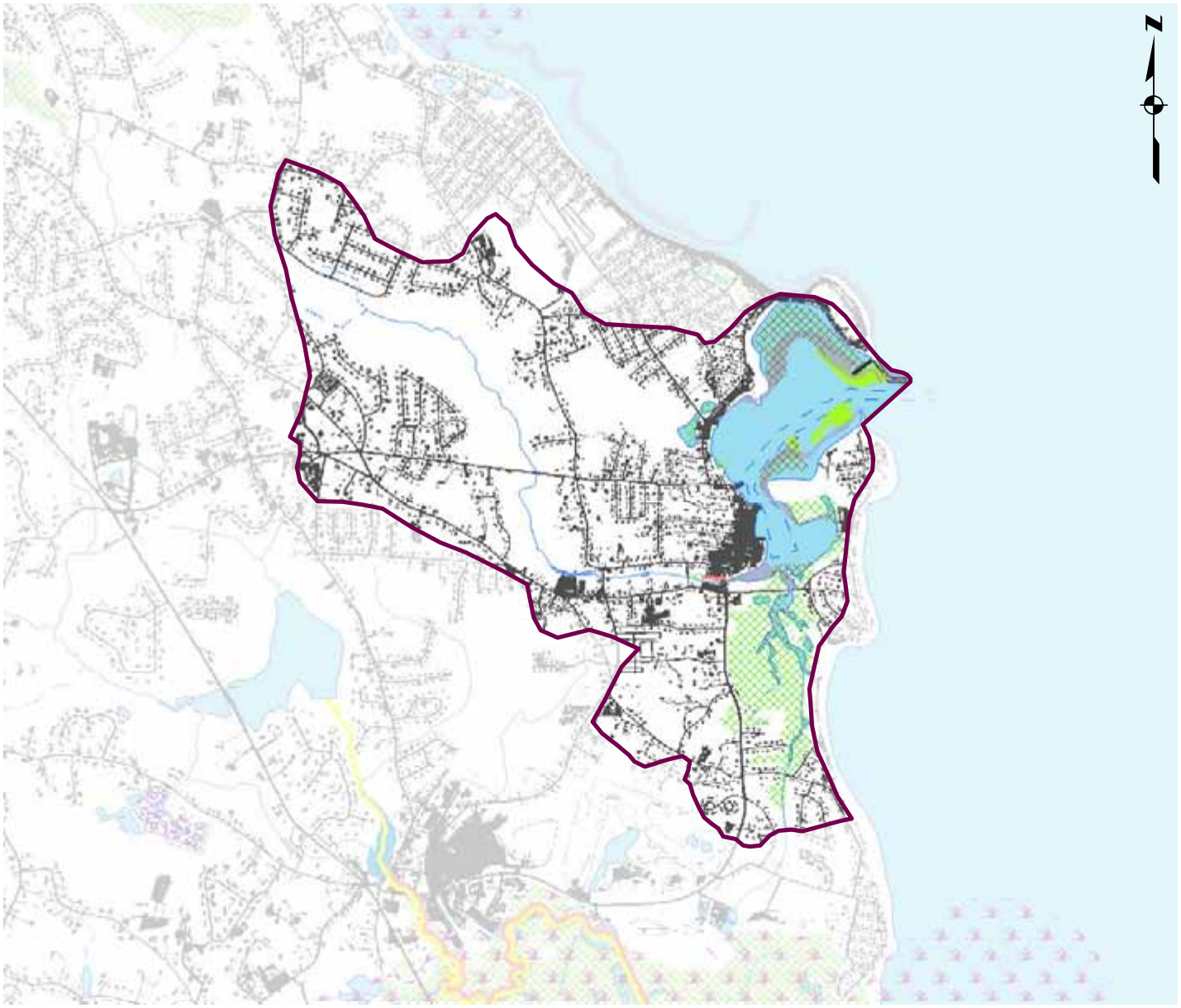

Legend

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SCITUATE HARBOR ESTUARINE RESOURCES

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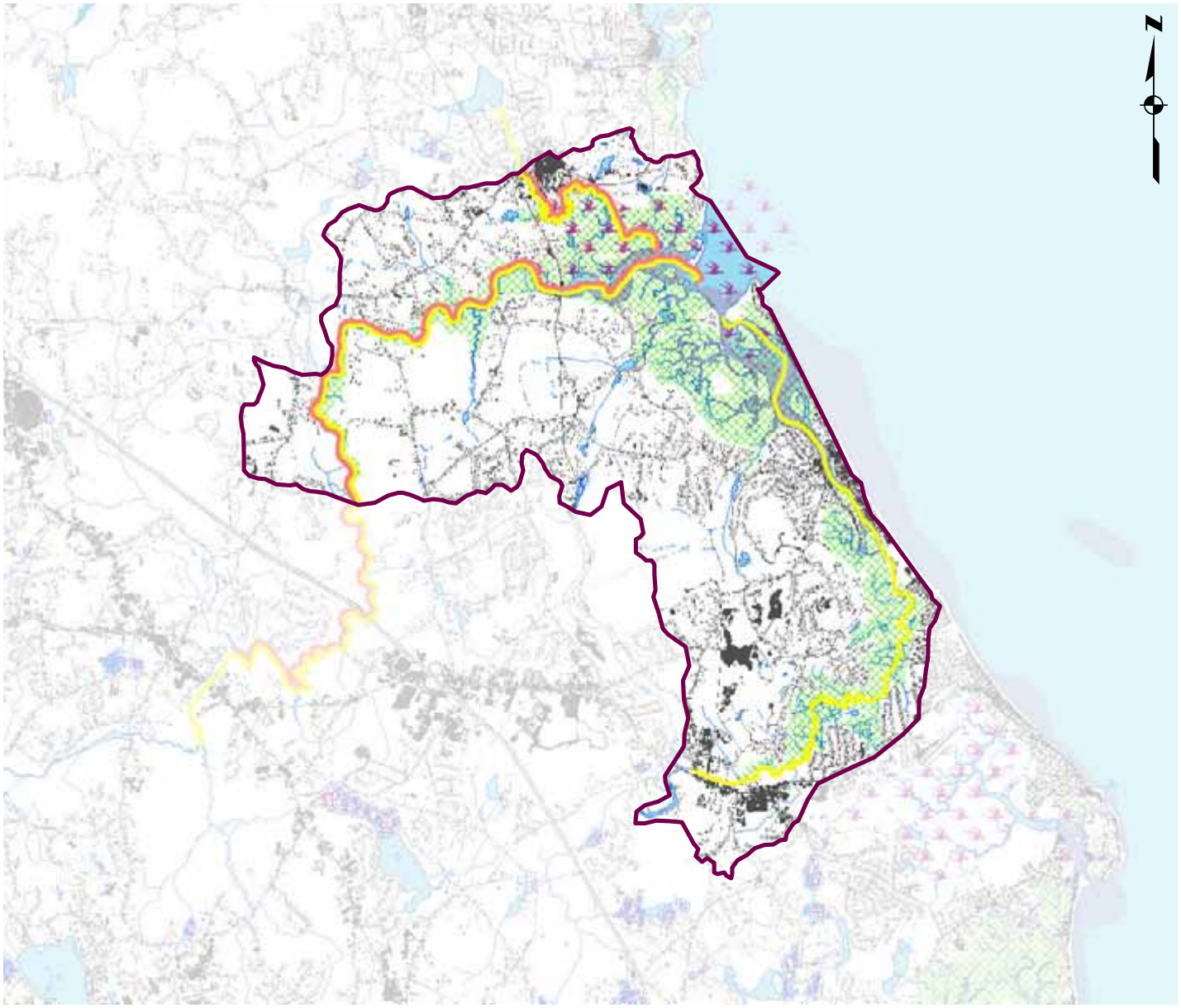

Legend

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NORTH RIVER / SOUTH RIVER ESTUARINE RESOURCES

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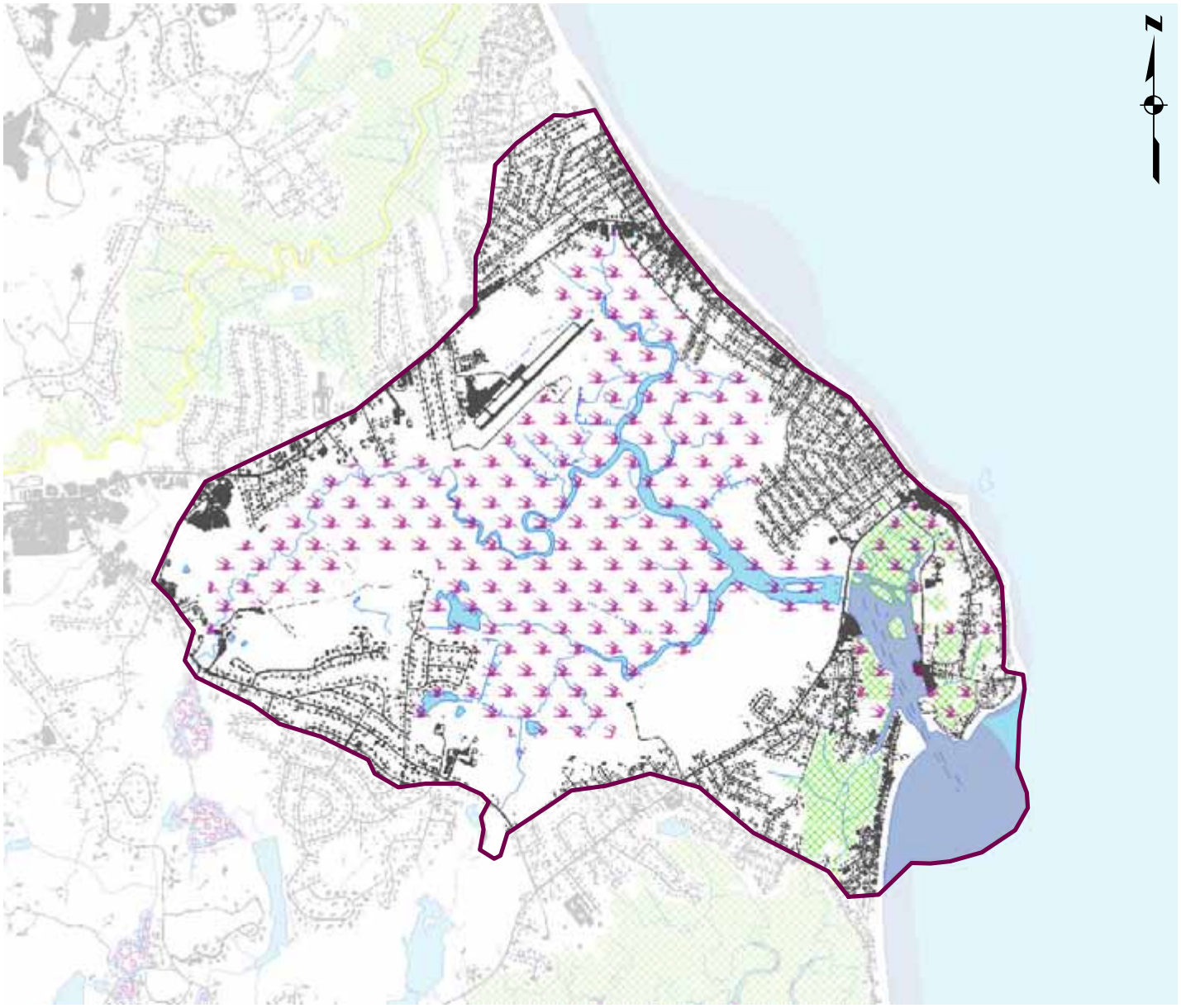

Legend

- Estuarine Watershed Boundary
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GREEN HARBOR
ESTUARINE RESOURCES

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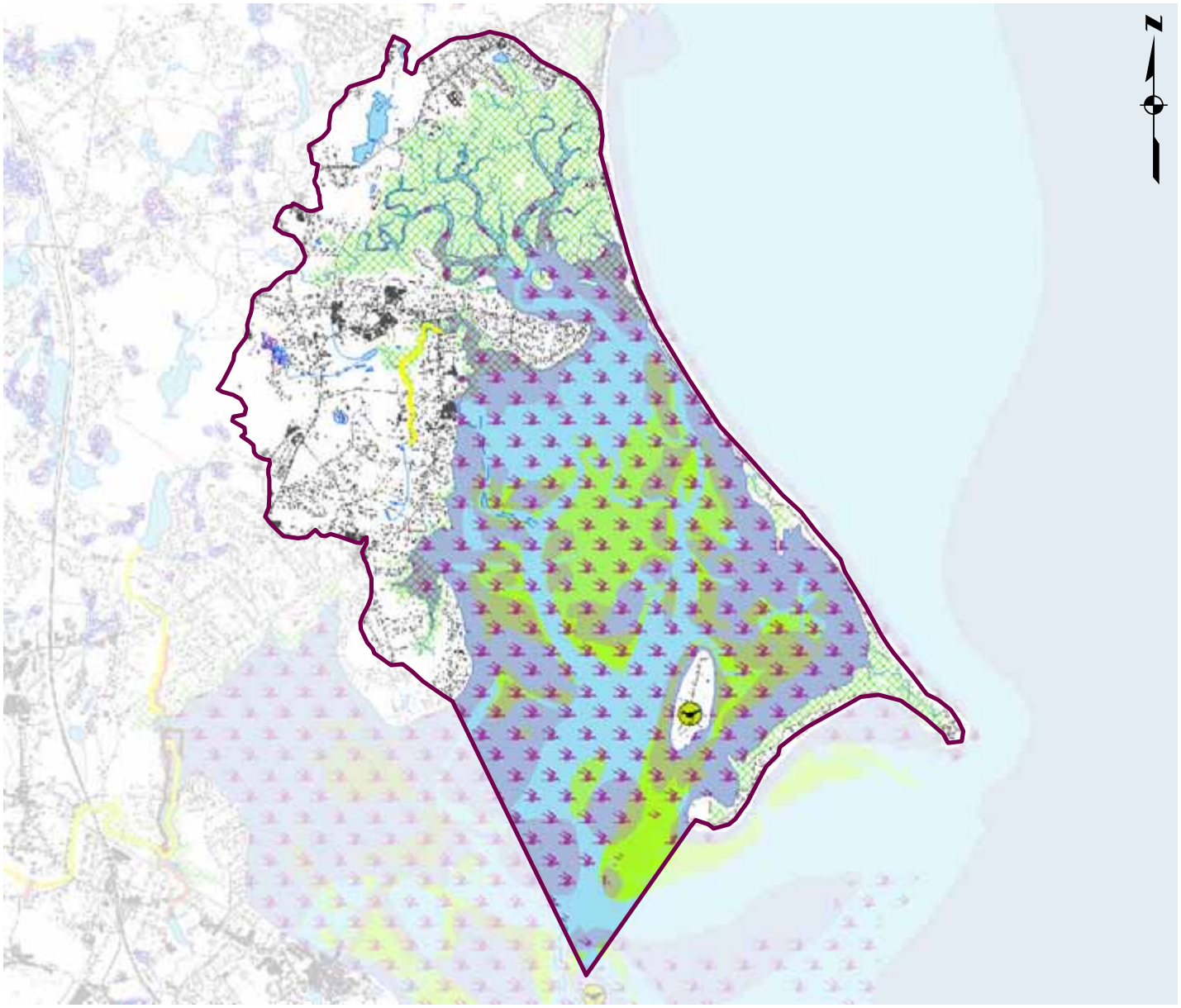

Legend

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BLUEFISH RIVER / BACK RIVER / DUXBURY BAY ESTUARINE RESOURCES

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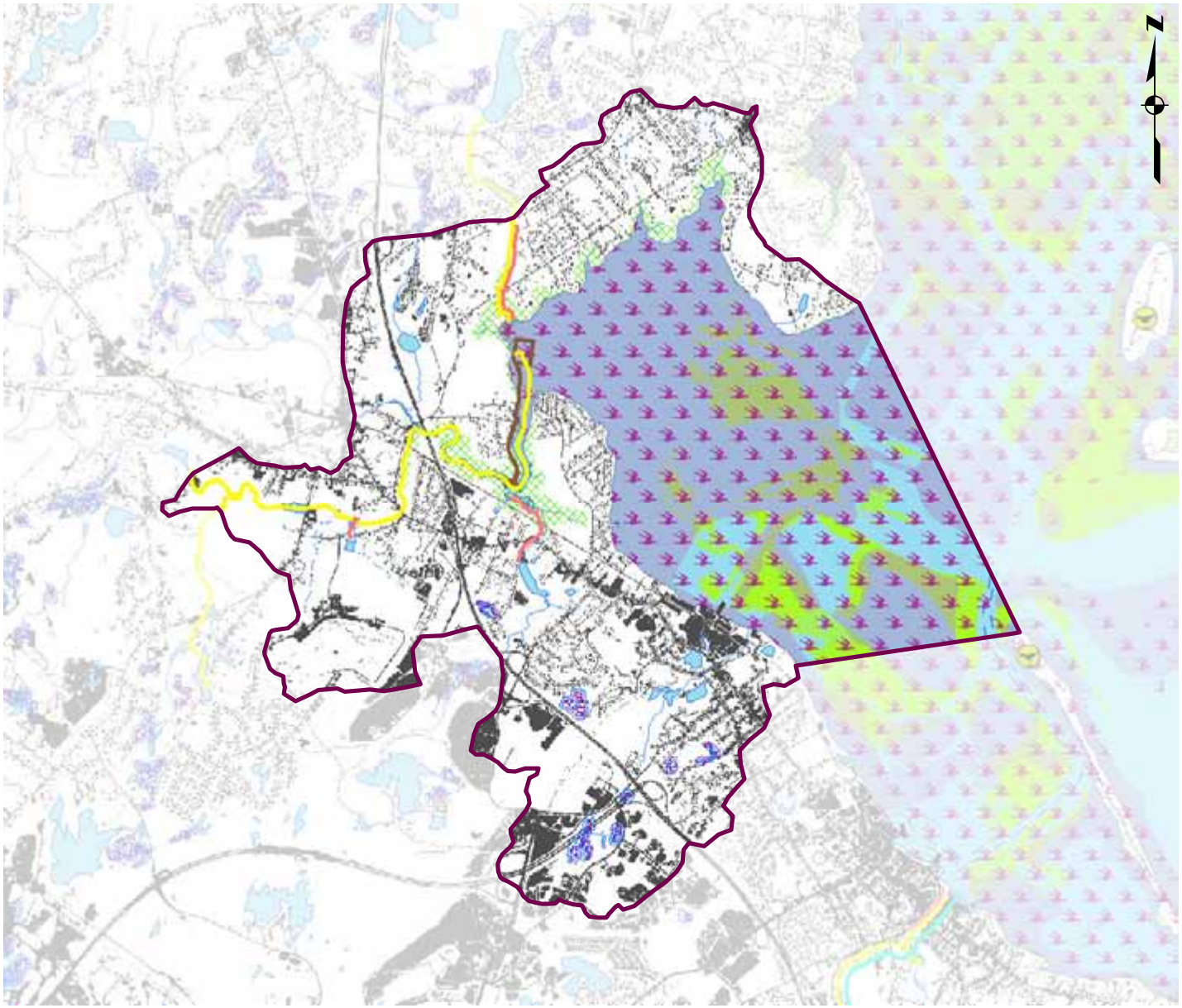

Legend

- Estuarine Watershed Boundary
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Anadromous Fish Run

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JONES RIVER / KINGSTON BAY ESTUARINE RESOURCES

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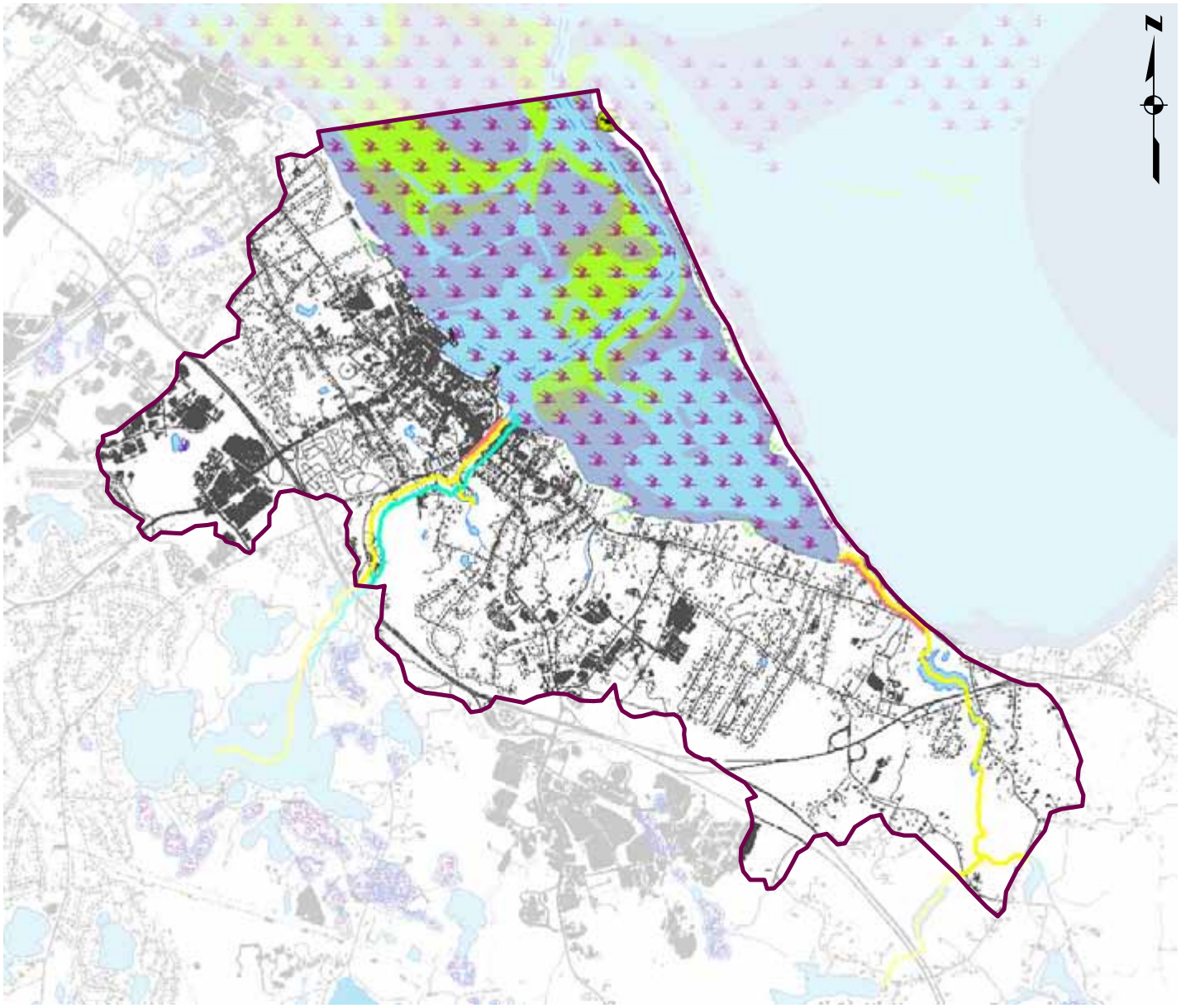

Legend

- Estuarine Watershed Boundary
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EEL RIVER / PLYMOUTH HARBOR ESTUARINE RESOURCES

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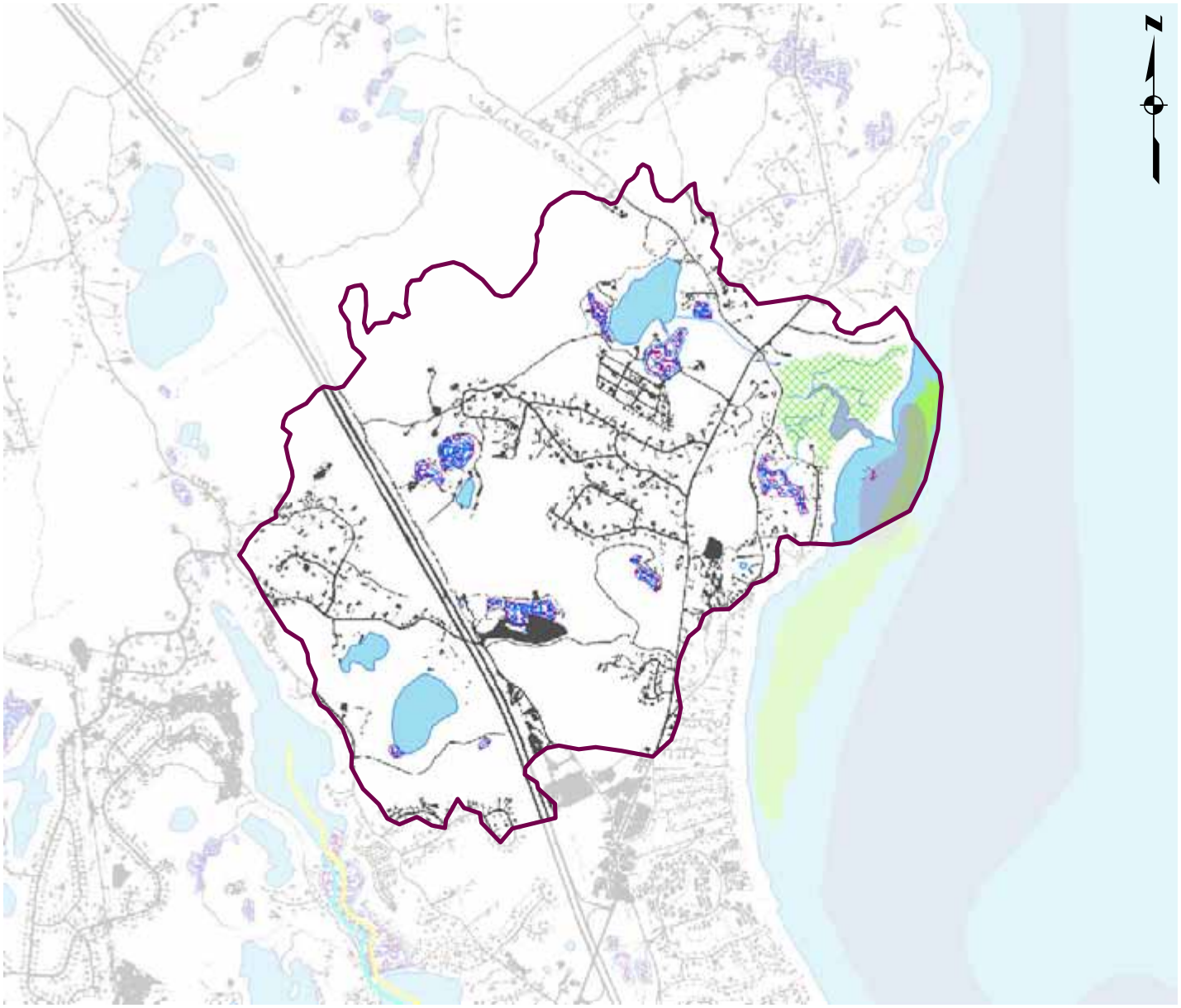

Legend

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ELLISVILLE HARBOR
ESTUARINE RESOURCES

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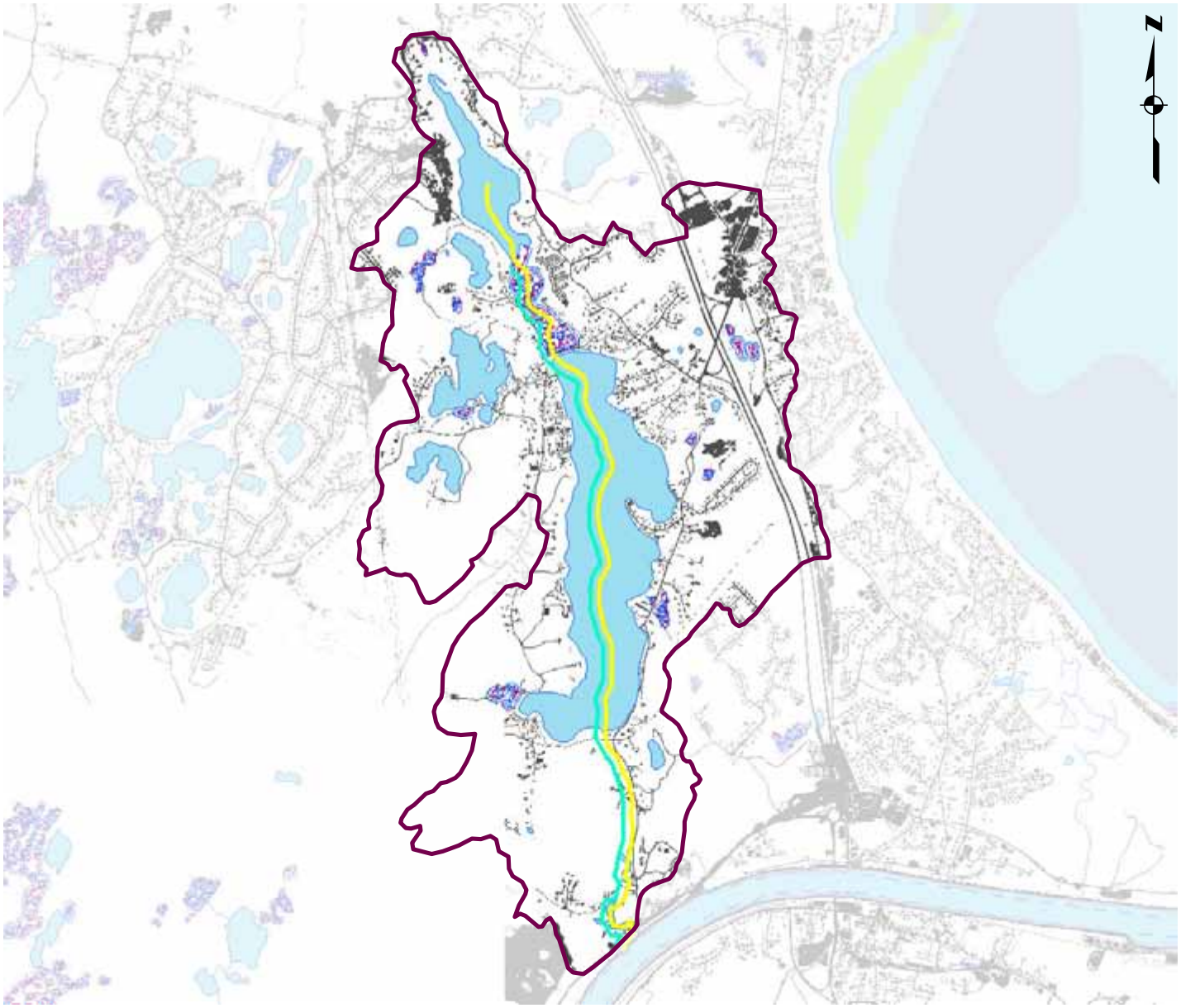

Legend

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GREAT HERRING POND / BOURNEDALE ESTUARINE RESOURCES

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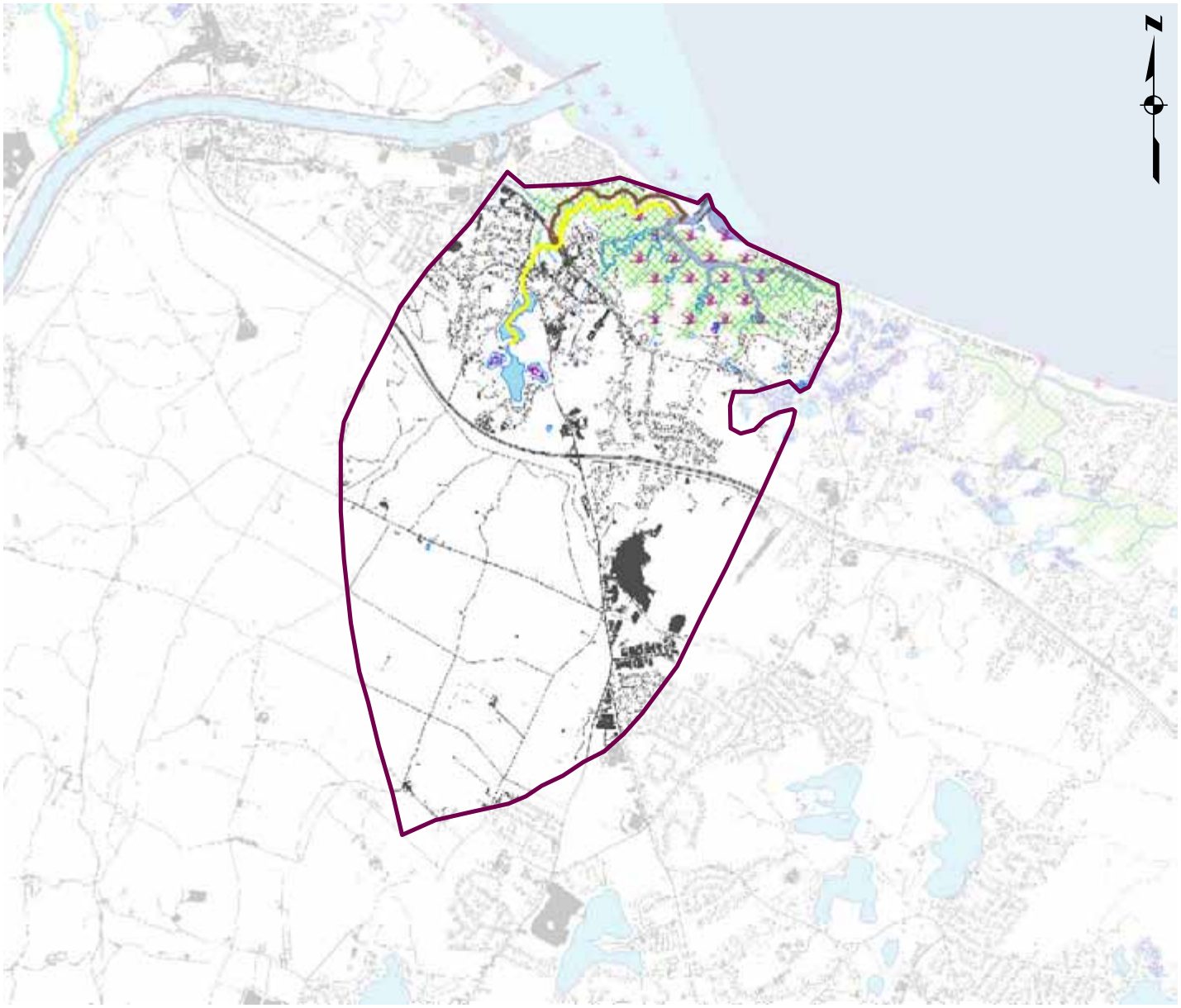

Legend

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SANDWICH HARBOR ESTUARINE RESOURCES

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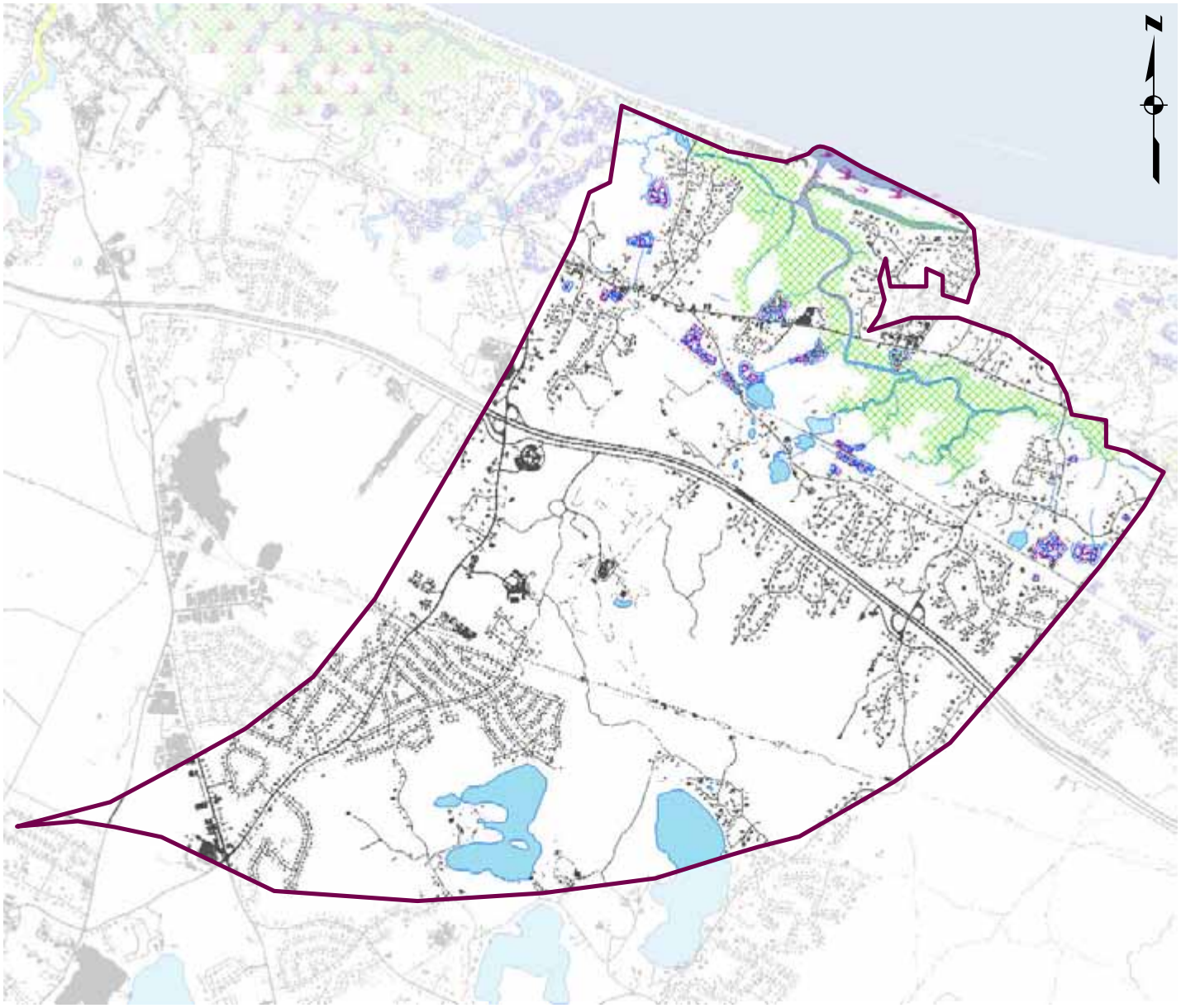

Legend

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SCORTON CREEK ESTUARINE RESOURCES

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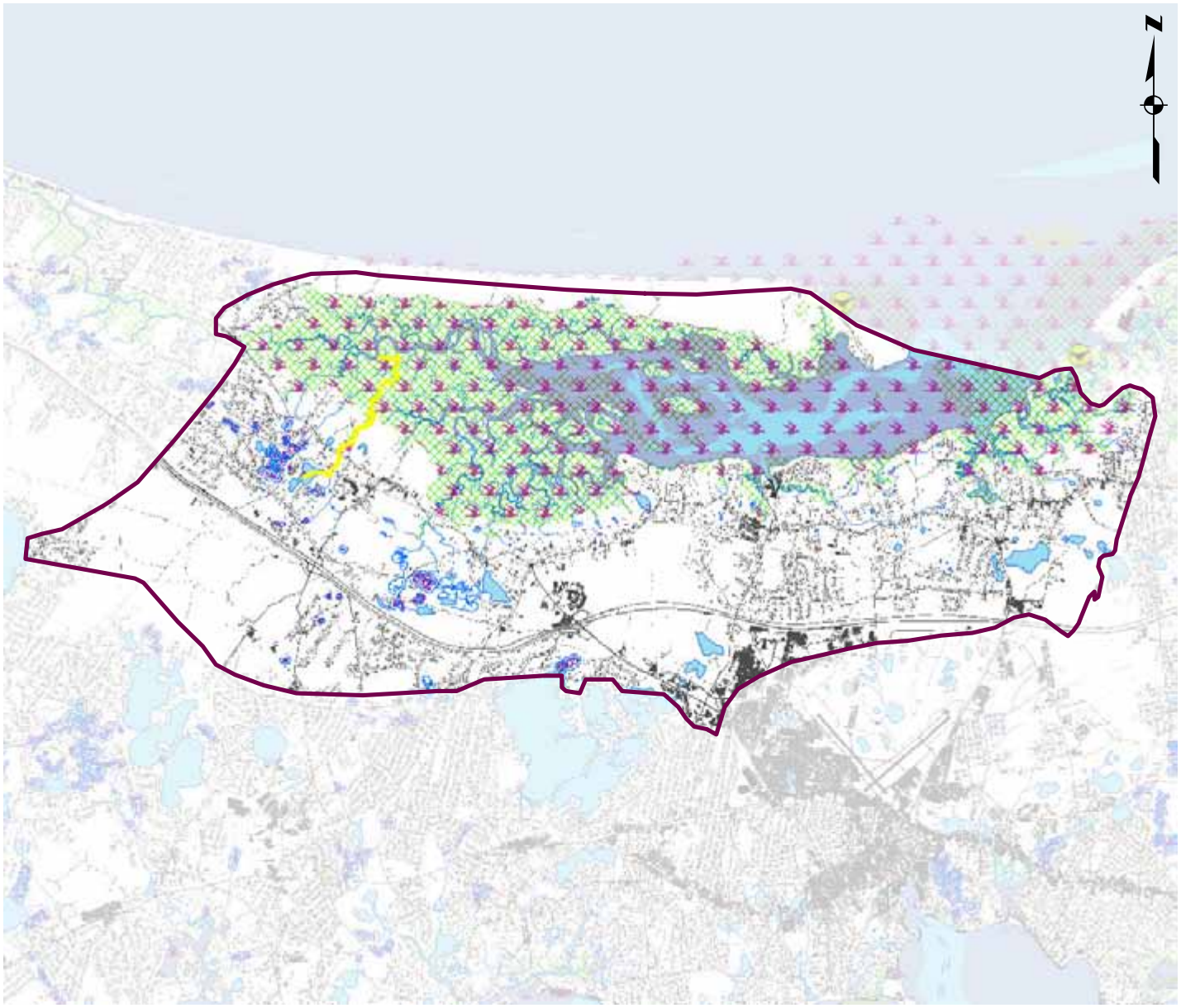

Legend

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BARNSTABLE HARBOR ESTUARINE RESOURCES

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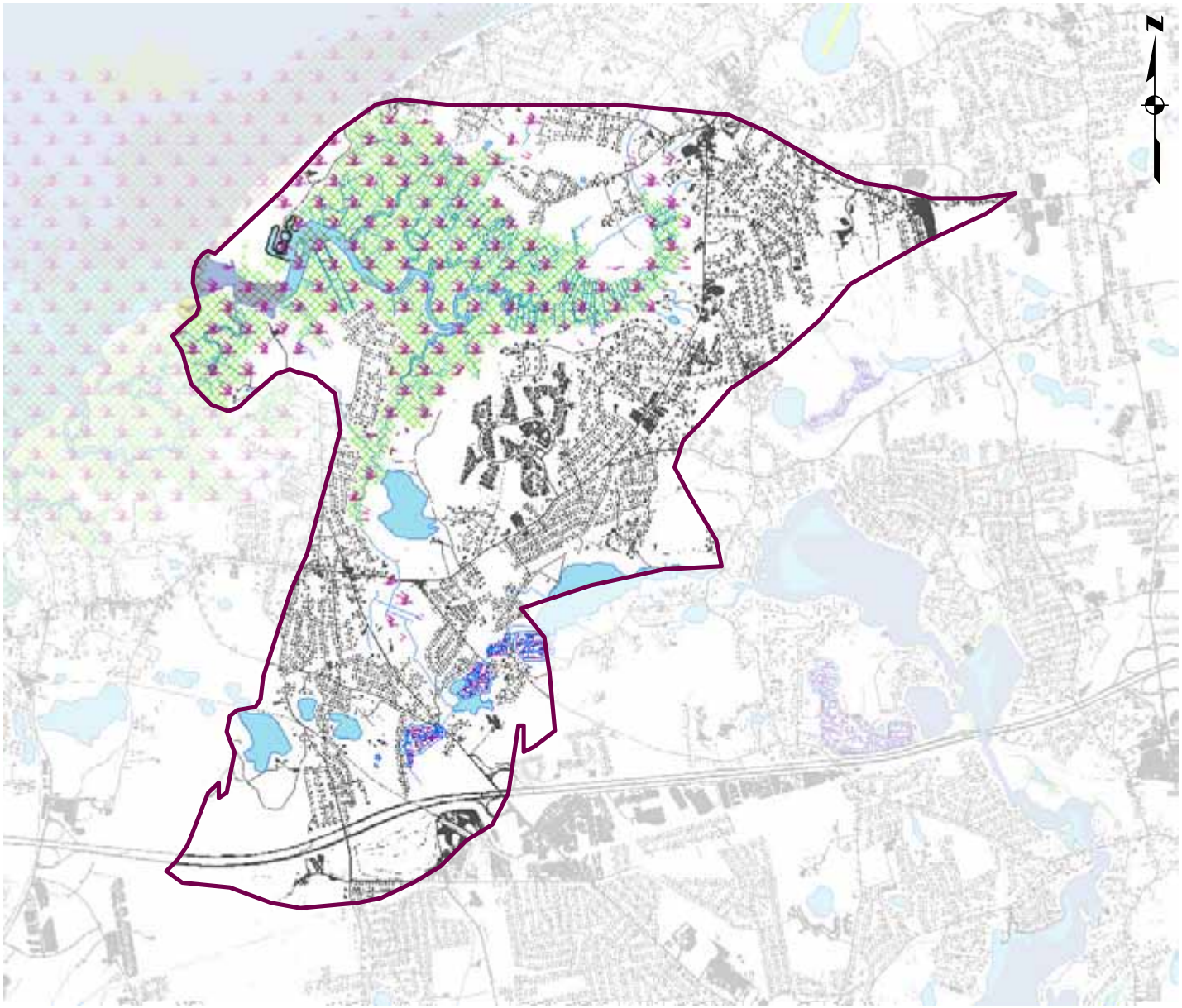

Legend

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CHASE GARDEN CREEK ESTUARINE RESOURCES

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Legend

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- Salt Marsh
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SESUIT CREEK / SESUIT HARBOR ESTUARINE RESOURCES

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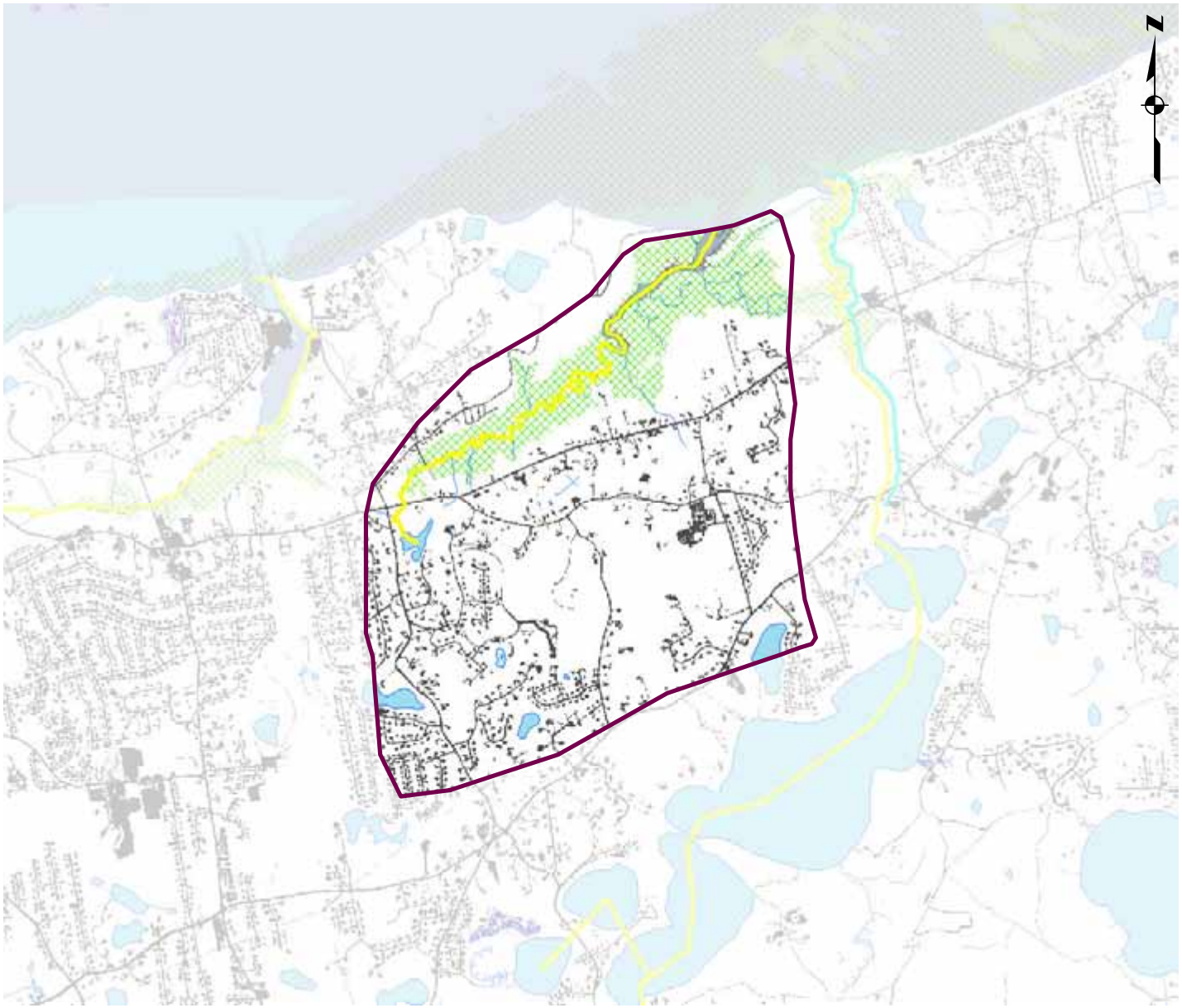

Legend

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QUIVETT CREEK
ESTUARINE RESOURCES

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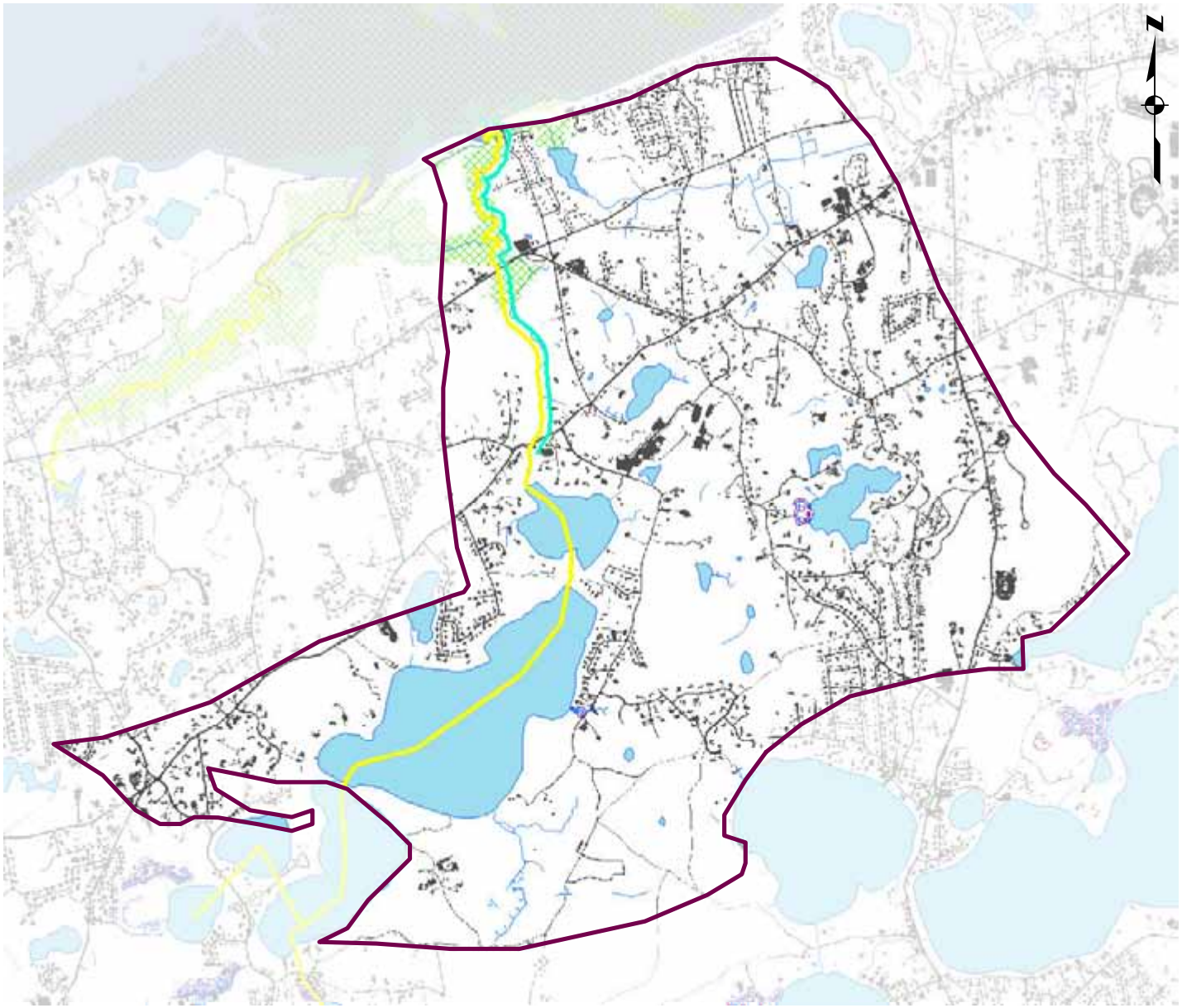

Legend

- Estuarine Watershed Boundary
- Salt Marsh
- Tidal Flat
- Shellfish Suitability Areas
- Shorebird Nesting Site
- Shorebird Habitat
- Seagrass Extent

Anadromous Fish Run

- Alewife
- Atlantic Sturgeon
- Blueback Herring
- Rainbow Smelt
- Shad

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PAINE'S CREEK / STONY BROOK ESTUARINE RESOURCES

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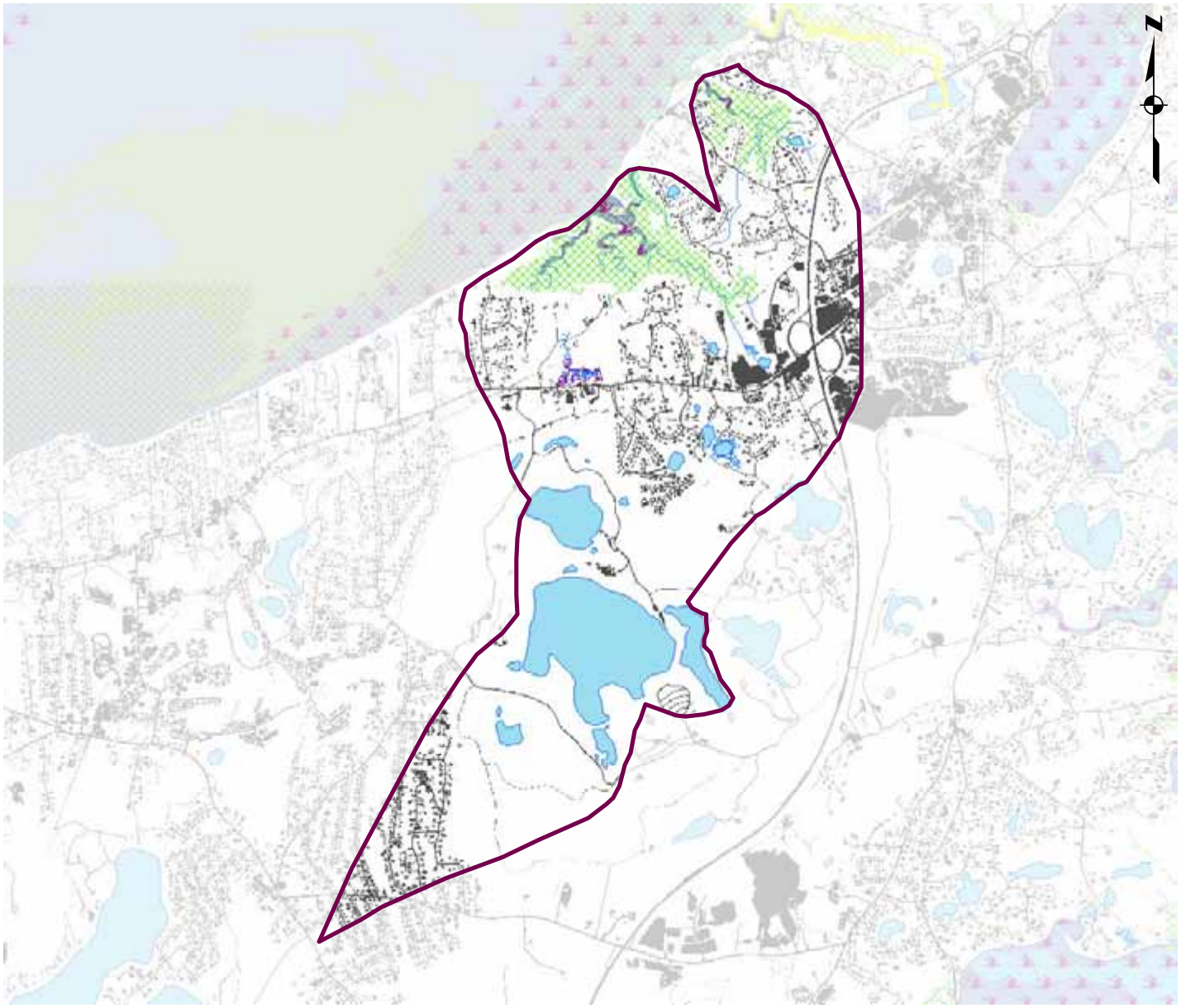

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NAMSKAKET CREEK / LITTLE NAMSKAKET CREEK ESTUARINE RESOURCES

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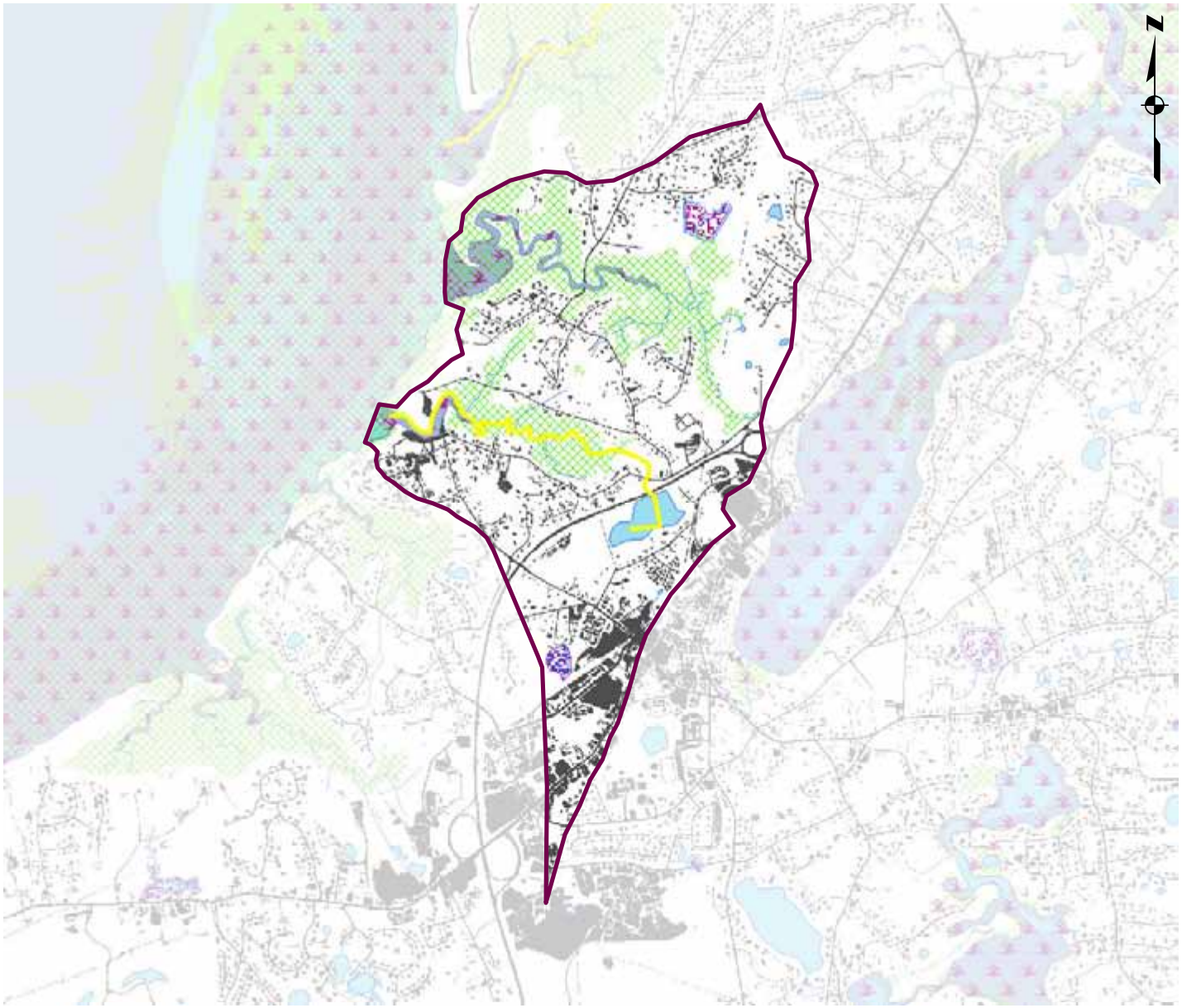

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BOAT MEADOW CREEK / ROCK HARBOR ESTUARINE RESOURCES

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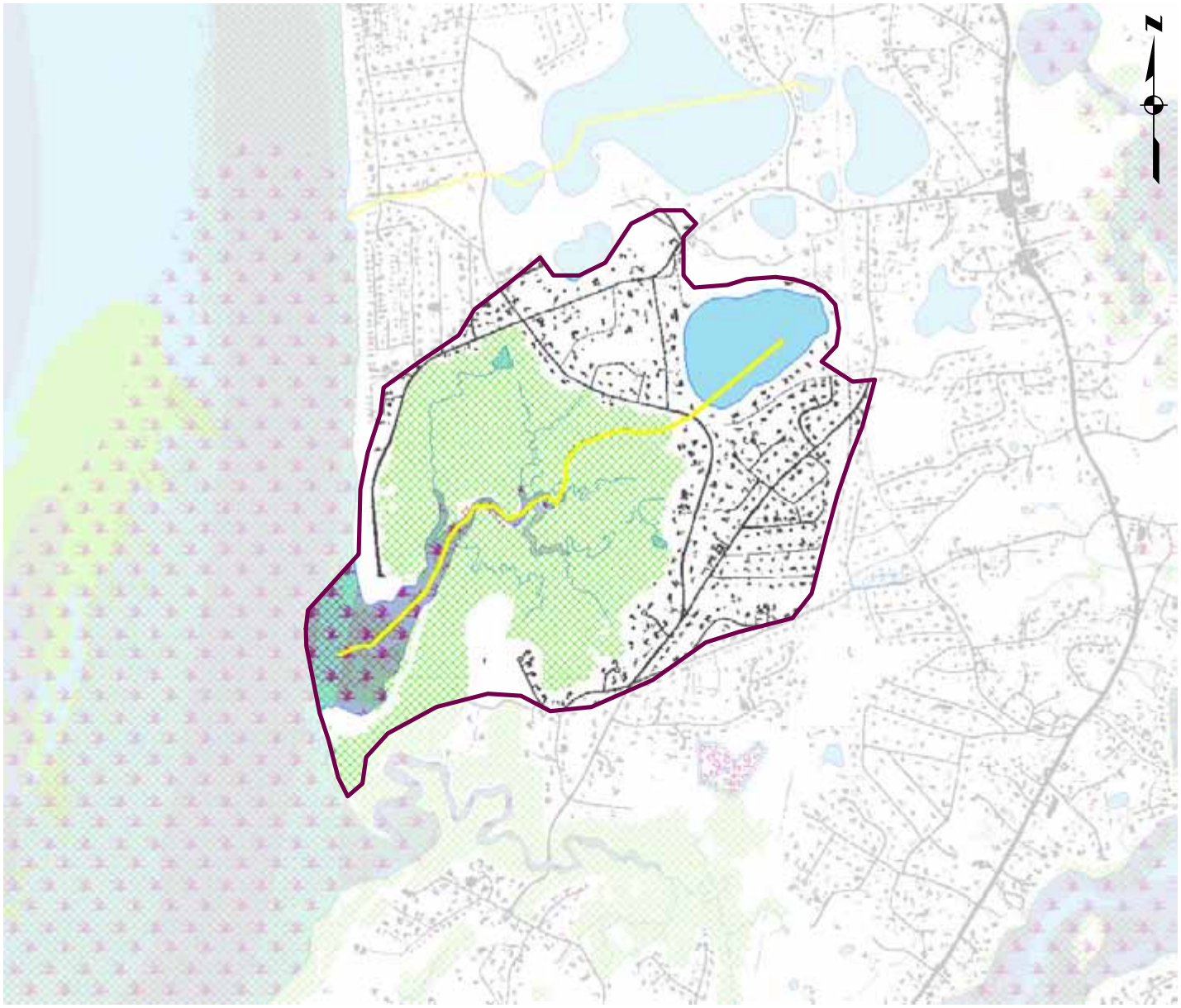

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HERRING RIVER / HERRING POND ESTUARINE RESOURCES

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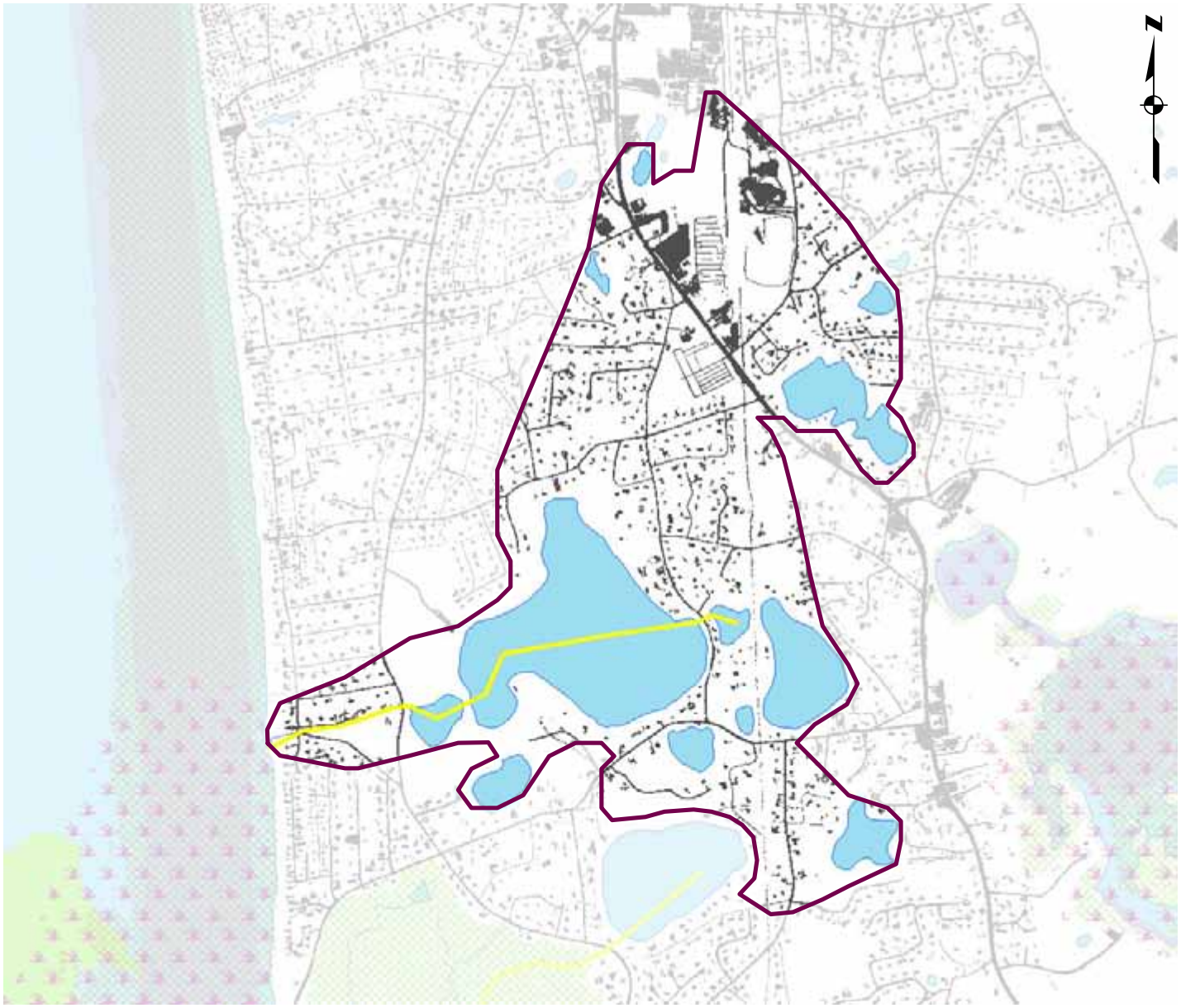

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HERRING BROOK / GREAT POND ESTUARINE RESOURCES

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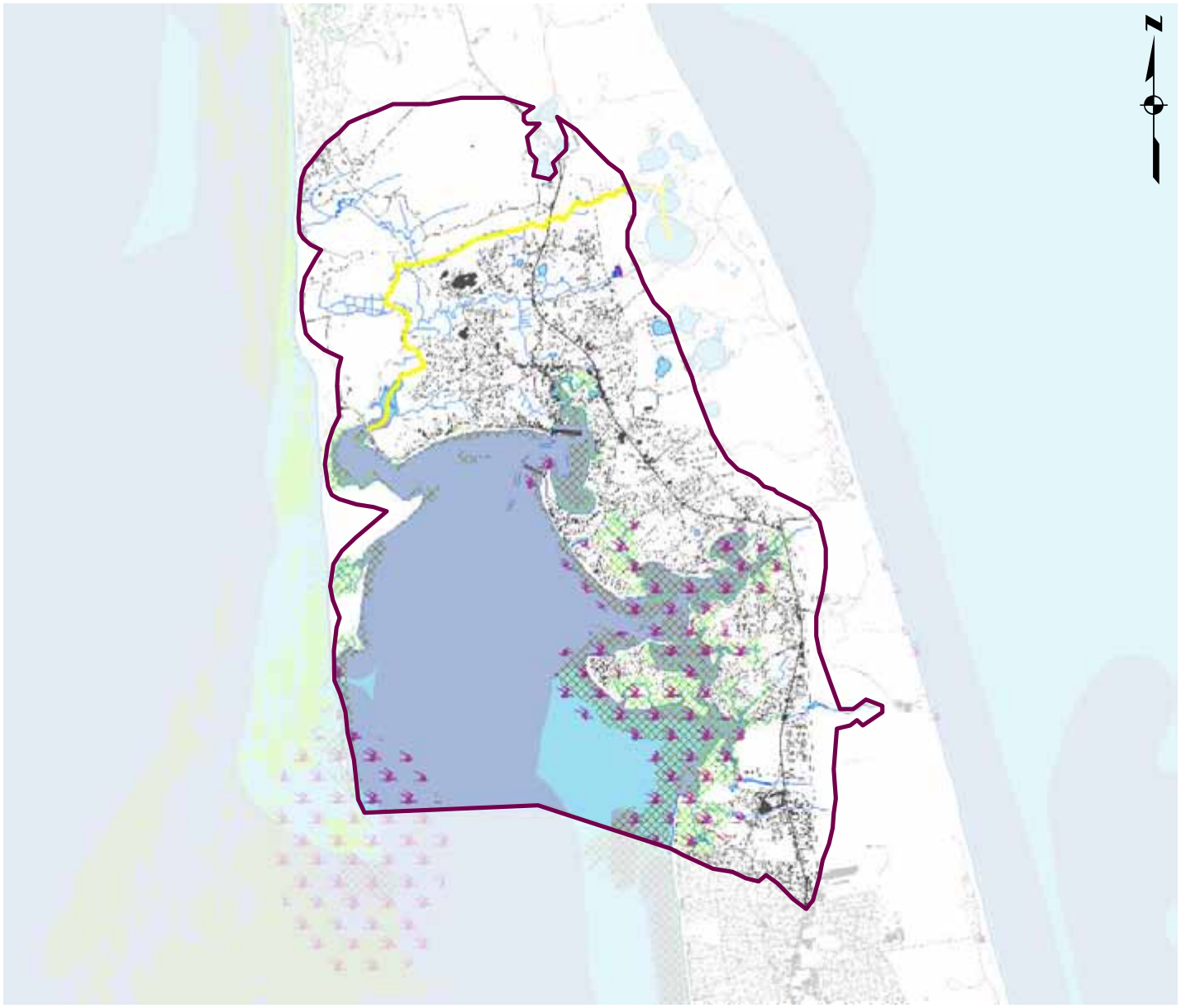

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WELLFLEET HARBOR ESTUARINE RESOURCES

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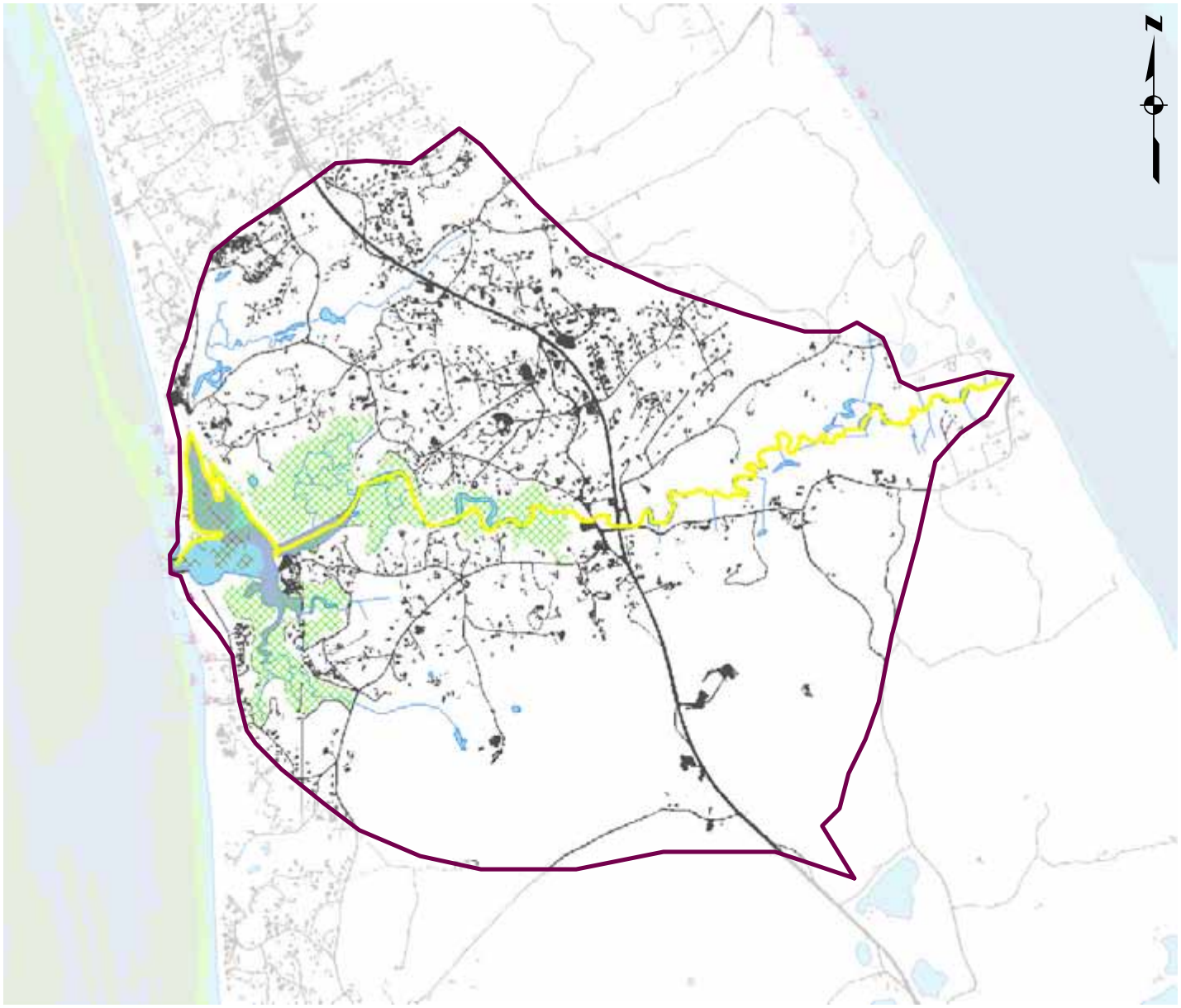

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PAMET RIVER / LITTLE PAMET RIVER ESTUARINE RESOURCES

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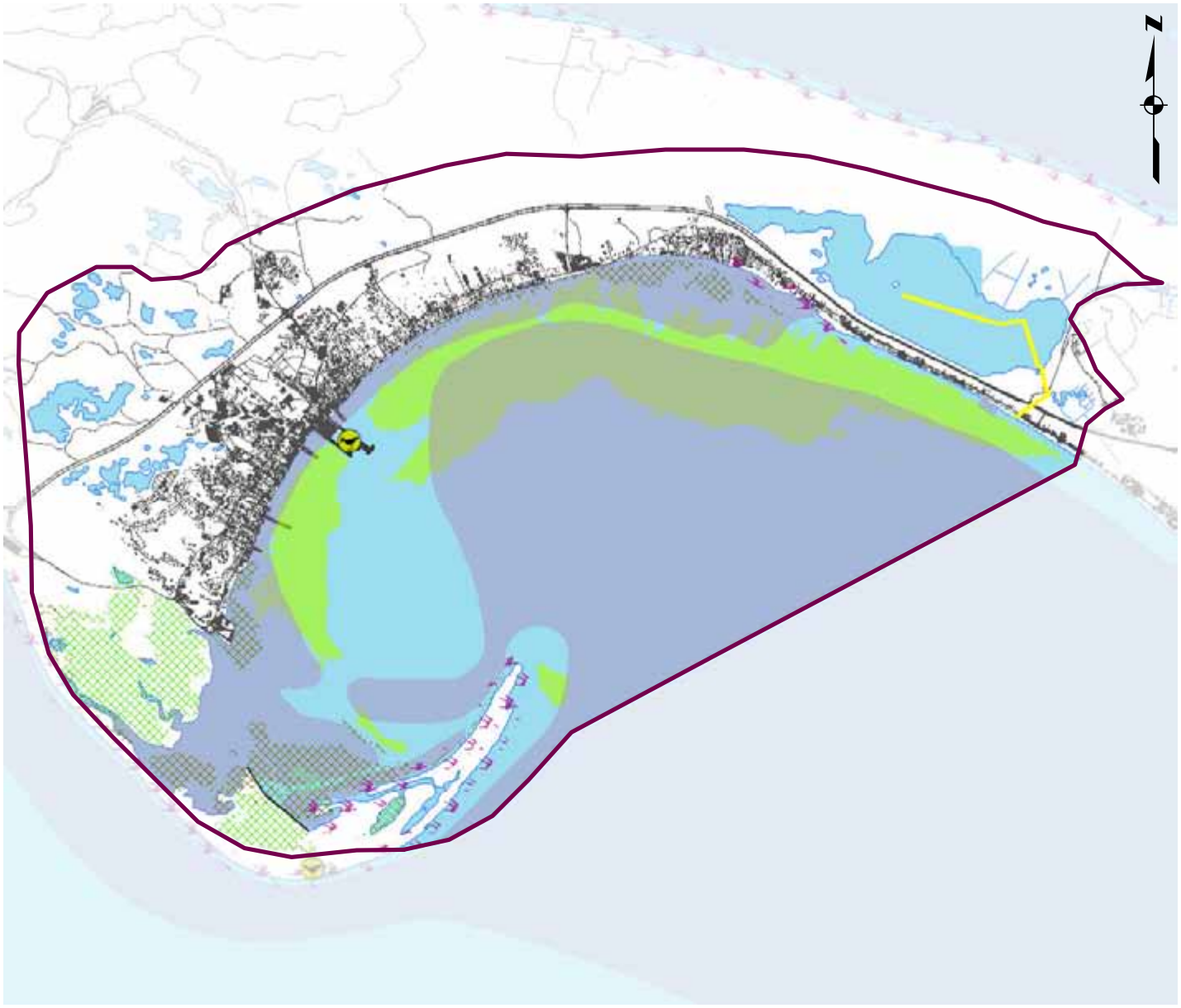

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PROVINCETOWN HARBOR ESTUARINE RESOURCES

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APPENDIX E

RESULTS OF ESTUARINE WATERSHED CHARACTERIZATION

TABLE OF INDICATOR STATISTICS:
STRESSORS (ENTIRE STUDY AREA)

					High Intensity Land Use			**Stormwater Runoff**			**Imperviousness**		
ID	ESTUARINE WATERSHE NAME	Total Watershed Area	Area of Land (acres)	Area of Open Water (acres)	High Intensity Land Use (acres)	High Intensity Land Use (% of Land Area)	High Intensity Land Use Ranking	Estimated Stormwater Volume (ac-ft/yr)	Estimated Stormwater Volume (in/yr)	Stormwater Runoff Ranking	Impervious Area (acres)	Impervious Area (%)	Impervious Area Ranking
1	MERRIMACK RIVER / BLACK ROCK CREEK	12940	11199	1741	3050.7	27.2%	B	3699	3.96	B	1406.4	12.6%	B
2	PARKER RIVER	7660	7198	462	1553.7	21.6%	A	2398	4.00	B	340.8	4.7%	A
3	ROWLEY RIVER	3185	2936	249	413.0	14.1%	A	852	3.48	B	141.4	4.8%	A
4	IPSWICH RIVER	6024	5637	387	1997.5	35.4%	B	2092	4.45	C	487.3	8.6%	A
5	PLUM ISLAND SOUND	29000	24063	4937	4836.5	20.1%	A	7657	3.82	B	1194.7	5.0%	A
6	ESSEX RIVER / ESSEX BAY	12369	10984	1385	1888.4	17.2%	A	2575	2.81	B	468.4	4.3%	A
7	ANNISQUAM RIVER	5649	4883	766	1535.4	31.4%	B	1797	4.42	C	667.7	13.7%	C
8	ROCKPORT HARBOR (SANDY BAY)	2477	1554	923	740.1	47.6%	C	640	4.94	C	302.6	19.5%	C
9	GLOUCESTER HARBOR	3115	1602	1513	911.6	56.9%	C	1013	7.59	D	463.7	28.9%	C
10	MANCHESTER HARBOR	4296	3967	329	1115.4	28.1%	B	1185	3.58	B	429.7	10.8%	B
11	DANVERS RIVER	18346	17740	606	11936.0	67.3%	D	12685	8.58	D	6138.6	34.6%	D
12	BEVERLY HARBOR	20573	19379	1194	13043.9	67.3%	D	13616	8.43	D	6699.0	34.6%	D
13	FOREST RIVER / SALEM HARBOR	4798	3655	1143	2246.2	61.5%	D	2734	8.98	D	1455.9	39.8%	D
14	MARBLEHEAD HARBOR	1143	785	359	679.2	86.6%	D	775	11.85	D	352.5	44.9%	D
15	SALEM SOUND	40124	32009	8114	18503.8	57.8%	D	18482	6.93	D	9473.7	29.6%	D
16	SAUGUS RIVER / PINES RIVER / LYNN HARBOR	17132	10864	6269	7161.5	65.9%	D	8635	9.54	D	4704.2	43.3%	D
17	BELLE ISLE CREEK / WINTHROP BAY	3644	3062	582	2146.6	70.1%	D	3241	12.70	D	1246.0	40.7%	D
18	CHELSEA CREEK / MYSTIC RIVER / CHARLES RIVER	16388	13862	2526	12621.4	91.0%	D	16758	14.51	D	9758.0	70.4%	D
19	NEPONSET RIVER / DORCHESTER BAY	11823	9665	2157	7912.7	81.9%	D	9790	12.15	D	5340.4	55.3%	D
20	BLACKS CREEK / QUINCY BAY	5331	1825	3506	1091.4	59.8%	D	933	6.13	C	551.7	30.2%	D
21	BACK RIVER / FORE RIVER / HINGHAM BAY	17864	10207	7657	5861.0	57.4%	C	5276	6.20	C	2966.2	29.1%	C
22	WEIR RIVER / STRAITS POND	3451	2816	635	1078.8	38.3%	B	969	4.13	C	426.6	15.1%	C
23	BOSTON HARBOR	67679	42415	25264	31035.6	73.2%	D	37331	10.56	D	20501.2	48.3%	D
24	LITTLE HARBOR	979	838	142	350.3	41.8%	C	287	4.12	C	77.6	9.3%	A
25	COHASSET HARBOR	4811	4291	520	1986.2	46.3%	C	1513	4.23	C	573.5	13.4%	B
26	SCITUATE HARBOR	1764	1616	148	915.8	56.7%	C	721	5.35	C	292.6	18.1%	C
27	NORTH RIVER / SOUTH RIVER	13590	12859	730	4220.2	32.8%	B	3693	3.45	B	1336.8	10.4%	B
28	GREEN HARBOR	3071	2795	276	1086.8	38.9%	C	1254	5.38	C	416.4	14.9%	C
29	BLUEFISH RIVER / BACK RIVER / DUXBURY BAY	10398	5000	5398	1582.9	31.7%	B	1027	2.46	B	487.6	9.8%	B
30	JONES RIVER / KINGSTON BAY	7861	4923	2938	2460.0	50.0%	C	1943	4.74	C	979.2	19.9%	C
31	EEL RIVER / PLYMOUTH HARBOR	5290	3617	1673	2004.8	55.4%	C	1319	4.37	C	902.9	25.0%	C
32	ELLISVILLE HARBOR	2188	2020	167	381.3	18.9%	A	221	1.31	A	198.3	9.8%	B
33	GREAT HERRING POND / BOURNEDALE	3498	2885	613	805.0	27.9%	B	384	1.60	A	329.6	11.4%	B
34	SANDWICH HARBOR	7124	7008	116	1266.4	18.1%	A	1225	2.10	A	629.3	9.0%	A
35	SCORTON CREEK	6383	6169	214	1537.9	24.9%	B	831	1.62	A	565.1	9.2%	A
36	BARNSTABLE HARBOR	20142	18206	1936	3665.9	20.1%	A	3609	2.38	B	1426.8	7.8%	A
37	CHASE GARDEN CREEK	4801	4634	167	1790.3	38.6%	C	912	2.36	A	654.8	14.1%	C
38	SESUIT CREEK / SESUIT HARBOR	1695	1586	109	762.0	48.0%	C	224	1.70	A	288.3	18.2%	C
39	QUIVETT CREEK	1470	1447	23	355.1	24.5%	A	166	1.38	A	146.1	10.1%	B
40	PAINE'S CREEK / STONY BROOK	3702	3301	401	821.7	24.9%	B	388	1.41	A	334.7	10.1%	B
41	NAMSKAKET CREEK / LITTLE NAMSKAKET CREEK	2976	2669	307	716.1	26.8%	B	542	2.44	B	327.7	12.3%	B
42	BOAT MEADOW CREEK / ROCK HARBOR	1315	1279	37	453.9	35.5%	B	354	3.32	B	172.8	13.5%	B
43	HERRING RIVER / HERRING POND	706	652	54	140.7	21.6%	A	101	1.85	A	46.9	7.2%	A
44	HERRING BROOK / GREAT POND	884	677	207	294.3	43.5%	C	67	1.19	A	96.7	14.3%	C
45	WELLFLEET HARBOR	17235	12323	4912	1916.6	15.6%	A	1157	1.13	A	935.7	7.6%	A
46	PAMET RIVER / LITTLE PAMET RIVER	3453	3399	53	483.6	14.2%	A	235	0.83	A	295.9	8.7%	A
47	PROVINCETOWN HARBOR	7821	3633	4188	664.2	18.3%	A	851	2.81	B	458.8	12.6%	B

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STRESSORS (ENTIRE STUDY AREA)

					Population			**Wastewater Discharge to Surface Water**			**Wastewater Discharge to Groundwater**		
ID	ESTUARINE WATERSHE NAME	Total Watershed Area	Area of Land (acres)	Area of Open Water (acres)	Estimated Population	Estimated Population Density (persons/ac)	Population Ranking	Number of Wastewater Treatment Plants discharging to surface water	Wastewater Treatment Plant Permitted Flow Rate (MGD)	Wastewater to Surface Water Ranking	Facilities discharging wastewater to groundwater (>10,000 gal/day)	Flowrate from facilities discharging wastewater to groundwater (MGD)	Wastewater to Groundwater Ranking
1	MERRIMACK RIVER / BLACK ROCK CREEK	12940	11199	1741	18725	1.67	C	3	6.6	D	0	0.000	A
2	PARKER RIVER	7660	7198	462	2475	0.34	A	0	0.0	A	1	0.015	B
3	ROWLEY RIVER	3185	2936	249	815	0.28	A	0	0.0	A	0	0.000	A
4	IPSWICH RIVER	6024	5637	387	7091	1.26	B	0	0.0	A	0	0.000	A
5	PLUM ISLAND SOUND	29000	24063	4937	12048	0.50	A	1	1.8	C	1	0.015	B
6	ESSEX RIVER / ESSEX BAY	12369	10984	1385	3793	0.35	A	0	0.0	A	0	0.000	A
7	ANNISQUAM RIVER	5649	4883	766	9064	1.86	C	0	0.0	A	0	0.000	A
8	ROCKPORT HARBOR (SANDY BAY)	2477	1554	923	4634	2.98	C	1	0.8	B	0	0.000	A
9	GLOUCESTER HARBOR	3115	1602	1513	9552	5.96	D	1	7.2	D	0	0.000	A
10	MANCHESTER HARBOR	4296	3967	329	4147	1.05	B	1	1.2	B	0	0.000	A
11	DANVERS RIVER	18346	17740	606	91225	5.14	C	0	0.0	A	0	0.000	A
12	BEVERLY HARBOR	20573	19379	1194	103156	5.32	D	0	0.0	A	0	0.000	A
13	FOREST RIVER / SALEM HARBOR	4798	3655	1143	27409	7.50	D	0	0.0	A	0	0.000	A
14	MARBLEHEAD HARBOR	1143	785	359	7359	9.38	D	0	0.0	A	0	0.000	A
15	SALEM SOUND	40124	32009	8114	149810	4.68	C	1	1.2	B	0	0.000	A
16	SAUGUS RIVER / PINES RIVER / LYNN HARBOR	17132	10864	6269	129179	11.89	D	1	25.8	D	0	0.000	A
17	BELLE ISLE CREEK / WINTHROP BAY	3644	3062	582	24090	7.87	D	0	0.0	A	0	0.000	A
18	CHELSEA CREEK / MYSTIC RIVER / CHARLES RIVER	16388	13862	2526	261269	18.85	D	0	0.0	A	0	0.000	A
19	NEPONSET RIVER / DORCHESTER BAY	11823	9665	2157	179633	18.59	D	0	0.0	A	0	0.000	A
20	BLACKS CREEK / QUINCY BAY	5331	1825	3506	16979	9.31	D	0	0.0	A	0	0.000	A
21	BACK RIVER / FORE RIVER / HINGHAM BAY	17864	10207	7657	59852	5.86	D	0	0.0	A	0	0.000	A
22	WEIR RIVER / STRAITS POND	3451	2816	635	5113	1.82	C	0	0.0	A	1	0.007	B
23	BOSTON HARBOR	67679	42415	25264	548641	12.94	D	0	0.0	A	1	0.007	B
24	LITTLE HARBOR	979	838	142	1376	1.64	C	0	0.0	A	0	0.000	A
25	COHASSET HARBOR	4811	4291	520	7018	1.64	C	1	0.1	B	0	0.000	A
26	SCITUATE HARBOR	1764	1616	148	4264	2.64	C	0	0.0	A	0	0.000	A
27	NORTH RIVER / SOUTH RIVER	13590	12859	730	13350	1.04	B	1	1.6	C	1	0.013	B
28	GREEN HARBOR	3071	2795	276	6306	2.26	C	0	0.0	A	0	0.000	A
29	BLUEFISH RIVER / BACK RIVER / DUXBURY BAY	10398	5000	5398	4669	0.93	B	0	0.0	A	1	0.031	C
30	JONES RIVER / KINGSTON BAY	7861	4923	2938	10067	2.04	C	0	0.0	A	1	0.907	D
31	EEL RIVER / PLYMOUTH HARBOR	5290	3617	1673	10377	2.87	C	1	1.8	C	0	0.000	A
32	ELLISVILLE HARBOR	2188	2020	167	1255	0.62	A	0	0.0	A	0	0.000	A
33	GREAT HERRING POND / BOURNEDALE	3498	2885	613	2904	1.01	B	0	0.0	A	1	0.080	D
34	SANDWICH HARBOR	7124	7008	116	3586	0.51	A	0	0.0	A	0	0.000	A
35	SCORTON CREEK	6383	6169	214	5531	0.90	B	0	0.0	A	2	0.035	C
36	BARNSTABLE HARBOR	20142	18206	1936	8333	0.46	A	0	0.0	A	0	0.000	A
37	CHASE GARDEN CREEK	4801	4634	167	5700	1.23	B	0	0.0	A	1	0.165	D
38	SESUIT CREEK / SESUIT HARBOR	1695	1586	109	1630	1.03	B	0	0.0	A	0	0.000	A
39	QUIVETT CREEK	1470	1447	23	968	0.67	A	0	0.0	A	0	0.000	A
40	PAINE'S CREEK / STONY BROOK	3702	3301	401	2445	0.74	B	0	0.0	A	1	0.032	C
41	NAMSKAKET CREEK / LITTLE NAMSKAKET CREEK	2976	2669	307	1697	0.64	A	0	0.0	A	4	0.135	D
42	BOAT MEADOW CREEK / ROCK HARBOR	1315	1279	37	1249	0.98	B	0	0.0	A	0	0.000	A
43	HERRING RIVER / HERRING POND	706	652	54	292	0.45	A	0	0.0	A	0	0.000	A
44	HERRING BROOK / GREAT POND	884	677	207	546	0.81	B	0	0.0	A	1	0.029	C
45	WELLFLEET HARBOR	17235	12323	4912	3172	0.26	A	0	0.0	A	1	0.022	C
46	PAMET RIVER / LITTLE PAMET RIVER	3453	3399	53	679	0.20	A	0	0.0	A	0	0.000	A
47	PROVINCETOWN HARBOR	7821	3633	4188	2926	0.81	B	0	0.0	A	1	0.575	D

TABLE OF INDICATOR STATISTICS:
STRESSORS (ENTIRE STUDY AREA)

					Septic System Use				Designated Shellfish Growing Area Status								
ID	ESTUARINE WATERSHE NAME	Total Watershed Area	Area of Land (acres)	Area of Open Water (acres)	Estimated Population using septic systems	Percentage of population using septic systems	Estimated flowrate from septic systems (MGD)	Septic System Ranking	Conditionally Approved (acres)	Prohibited (acres)	Approved (acres)	Conditionally Restricted (acres)	Management Close (acres)	Restricted (acres)	TOTAL (acres)	Percentage Conditionally Approved or Approved	DSGA Ranking
1	MERRIMACK RIVER / BLACK ROCK CREEK	12940	11199	1741	3305	18%	0.229	C	0	1647	22	970	0	0	2640	0.84%	C
2	PARKER RIVER	7660	7198	462	1384	56%	0.096	B	155	277	0	0	0	0	432	35.93%	B
3	ROWLEY RIVER	3185	2936	249	702	86%	0.049	B	244	0	0	0	0	0	244	100.00%	A
4	IPSWICH RIVER	6024	5637	387	3523	50%	0.244	C	284	124	1	0	0	0	409	69.65%	B
5	PLUM ISLAND SOUND	29000	24063	4937	6440	53%	0.446	D	3663	401	964	52	0	0	5079	91.09%	A
6	ESSEX RIVER / ESSEX BAY	12369	10984	1385	1877	49%	0.130	C	1878	107	70	0	0	30	2084	93.44%	A
7	ANNISQUAM RIVER	5649	4883	766	4387	48%	0.304	D	816	170	142	0	0	0	1127	84.94%	A
8	ROCKPORT HARBOR (SANDY BAY)	2477	1554	923	2304	50%	0.160	C	0	915	0	0	0	0	915	0.00%	D
9	GLOUCESTER HARBOR	3115	1602	1513	4736	50%	0.328	D	0	1533	0	0	0	0	1533	0.00%	D
10	MANCHESTER HARBOR	4296	3967	329	68	2%	0.005	A	0	330	0	0	0	0	330	0.00%	D
11	DANVERS RIVER	18346	17740	606	0	0%	0.000	A	0	697	0	0	0	0	697	0.00%	C
12	BEVERLY HARBOR	20573	19379	1194	0	0%	0.000	A	0	1344	0	0	0	0	1344	0.00%	C
13	FOREST RIVER / SALEM HARBOR	4798	3655	1143	0	0%	0.000	A	0	1133	0	0	0	0	1133	0.00%	C
14	MARBLEHEAD HARBOR	1143	785	359	0	0%	0.000	A	0	362	0	0	0	0	362	0.00%	C
15	SALEM SOUND	40124	32009	8114	68	0%	0.005	A	0	8305	0	0	0	0	8305	0.00%	D
16	SAUGUS RIVER / PINES RIVER / LYNN HARBOR	17132	10864	6269	0	0%	0.000	A	0	6629	0	222	0	0	6851	0.00%	C
17	BELLE ISLE CREEK / WINTHROP BAY	3644	3062	582	0	0%	0.000	A	0	712	0	403	0	0	1115	0.00%	C
18	CHELSEA CREEK / MYSTIC RIVER / CHARLES RIVER	16388	13862	2526	0	0%	0.000	A	0	2606	0	128	0	0	2734	0.00%	C
19	NEPONSET RIVER / DORCHESTER BAY	11823	9665	2157	0	0%	0.000	A	0	2373	0	149	0	0	2522	0.00%	C
20	BLACKS CREEK / QUINCY BAY	5331	1825	3506	0	0%	0.000	A	0	2892	0	950	0	0	3841	0.00%	C
21	BACK RIVER / FORE RIVER / HINGHAM BAY	17864	10207	7657	0	0%	0.000	A	0	7378	0	1166	4	0	8548	0.00%	C
22	WEIR RIVER / STRAITS POND	3451	2816	635	532	10%	0.037	B	0	350	0	257	0	0	607	0.00%	D
23	BOSTON HARBOR	67679	42415	25264	532	0%	0.037	B	0	8090	0	245	1	0	8336	0.00%	D
24	LITTLE HARBOR	979	838	142	670	49%	0.046	B	0	188	0	0	0	0	188	0.00%	D
25	COHASSET HARBOR	4811	4291	520	3489	50%	0.242	C	0	261	487	0	0	0	748	65.09%	B
26	SCITUATE HARBOR	1764	1616	148	2088	49%	0.145	C	0	193	7	0	0	0	201	3.64%	B
27	NORTH RIVER / SOUTH RIVER	13590	12859	730	7367	55%	0.511	D	243	681	39	0	0	0	963	29.26%	B
28	GREEN HARBOR	3071	2795	276	3154	50%	0.219	C	0	59	123	0	0	0	182	67.77%	B
29	BLUEFISH RIVER / BACK RIVER / DUXBURY BAY	10398	5000	5398	3902	84%	0.270	D	107	19	5601	0	0	0	5727	99.67%	A
30	JONES RIVER / KINGSTON BAY	7861	4923	2938	6140	61%	0.426	D	845	514	1552	0	0	0	2912	82.33%	B
31	EEL RIVER / PLYMOUTH HARBOR	5290	3617	1673	5185	50%	0.359	D	0	1663	0	0	0	0	1663	0.00%	D
32	ELLISVILLE HARBOR	2188	2020	167	627	50%	0.043	B	0	8	80	0	0	0	88	90.92%	A
33	GREAT HERRING POND / BOURNEDALE	3498	2885	613	1656	57%	0.115	C	0		0	0	0	0	0	NA	A
34	SANDWICH HARBOR	7124	7008	116	3584	100%	0.248	D	43	33	11	0	0	0	88	62.34%	B
35	SCORTON CREEK	6383	6169	214	5530	100%	0.383	D	0	32	7	0	0	0	39	18.57%	B
36	BARNSTABLE HARBOR	20142	18206	1936	4862	58%	0.337	D	601	116	2091	0	0	0	2809	95.86%	A
37	CHASE GARDEN CREEK	4801	4634	167	5696	100%	0.395	D	65	55	7	0	0	0	126	56.52%	B
38	SESUIT CREEK / SESUIT HARBOR	1695	1586	109	1630	100%	0.113	C	41	0	4	0	0	0	45	100.00%	A
39	QUIVETT CREEK	1470	1447	23	967	100%	0.067	B	0	12	0	0	0	0	12	0.00%	D
40	PAINE'S CREEK / STONY BROOK	3702	3301	401	2445	100%	0.169	C	0	1	0	0	0	0	1	0.00%	D
41	NAMSKAKET CREEK / LITTLE NAMSKAKET CREEK	2976	2669	307	1333	79%	0.092	B	0	11	0	0	0	0	11	0.00%	D
42	BOAT MEADOW CREEK / ROCK HARBOR	1315	1279	37	845	68%	0.059	B	0	31	0	0	0	0	31	0.48%	C
43	HERRING RIVER / HERRING POND	706	652	54	288	99%	0.020	B	0	29	7	0	0	0	36	19.42%	B
44	HERRING BROOK / GREAT POND	884	677	207	546	100%	0.038	B	0	0	0	0	0	0	0	100.00%	A
45	WELLFLEET HARBOR	17235	12323	4912	3157	100%	0.219	C	194	86	5817	0	0	0	6096	98.58%	A
46	PAMET RIVER / LITTLE PAMET RIVER	3453	3399	53	678	100%	0.047	B	34	16	0	0	0	0	51	67.50%	B
47	PROVINCETOWN HARBOR	7821	3633	4188	1483	51%	0.103	C	485	595	3278	0	0	0	4357	86.35%	A

TABLE OF INDICATOR STATISTICS:
STRESSORS (ENTIRE STUDY AREA)

Geosyntec Consultants, Inc.

					303(d) listed impairments (waterbodies)							303(d) listed impairments (streams)						
ID	ESTUARINE WATERSHE NAME	Total Watershed Area	Area of Land (acres)	Area of Open Water (acres)	Nutrient Listing (acres)	Bacteria Listing (acres)	Total Assessed Area (ac)	Nutrient Listing (%)	Nutrient Ranking - Waterbodies	Bacteria Listing (%)	Bacteria Ranking - Waterbodies	Nutrient Listing (miles)	Bacteria Listing (miles)	Total Assessed Length (miles)	Nutrient Listing (%)	Nutrient Ranking - Streams	Bacteria Listing (%)	Bacteria Ranking - Streams
1	MERRIMACK RIVER / BLACK ROCK CREEK	12940	11199	1741	0.0	2669.7	2670	0.0%	A	100.0%	D	0.00	0.00	0.00	NA	A	NA	A
2	PARKER RIVER	7660	7198	462	0.0	491.7	494	0.0%	A	99.5%	C	0.00	0.00	0.00	0.0%	A	0.0%	A
3	ROWLEY RIVER	3185	2936	249	0.0	186.7	187	0.0%	A	100.0%	D	0.00	0.00	0.90	0.0%	A	0.0%	A
4	IPSWICH RIVER	6024	5637	387	0.0	301.2	301	0.0%	A	100.0%	D	0.00	3.71	6.24	0.0%	A	59.5%	B
5	PLUM ISLAND SOUND	29000	24063	4937	0.0	4386.4	4388	0.0%	A	100.0%	D	0.00	3.71	7.15	0.0%	A	51.9%	B
6	ESSEX RIVER / ESSEX BAY	12369	10984	1385	0.0	947.3	947	0.0%	A	100.0%	D	0.00	0.37	0.37	0.0%	A	100.0%	D
7	ANNISQUAM RIVER	5649	4883	766	3.3	587.4	619	0.5%	B	94.9%	C	0.00	0.00	0.38	0.0%	A	0.0%	A
8	ROCKPORT HARBOR (SANDY BAY)	2477	1554	923	0.0	15.7	23	0.0%	A	67.8%	B	0.00	0.00	0.00	NA	A	NA	A
9	GLOUCESTER HARBOR	3115	1602	1513	0.0	1486.2	1491	0.0%	A	99.7%	C	0.00	0.00	0.00	NA	A	NA	A
10	MANCHESTER HARBOR	4296	3967	329	0.0	306.9	307	0.0%	A	100.0%	D	0.00	2.76	2.76	0.0%	A	100.0%	D
11	DANVERS RIVER	18346	17740	606	92.8	701.4	736	12.6%	C	95.4%	C	6.24	9.08	14.20	43.9%	B	63.9%	B
12	BEVERLY HARBOR	20573	19379	1194	92.8	1347.8	1382	6.7%	B	97.5%	C	6.24	9.08	14.20	43.9%	B	63.9%	B
13	FOREST RIVER / SALEM HARBOR	4798	3655	1143	0.0	1099.0	1115	0.0%	A	98.5%	C	0.00	0.00	0.00	NA	A	NA	A
14	MARBLEHEAD HARBOR	1143	785	359	0.0	359.4	359	0.0%	A	100.0%	D	0.00	0.00	0.00	NA	A	NA	A
15	SALEM SOUND	40124	32009	8114	92.8	8169.0	8220	1.1%	B	99.4%	C	6.24	11.83	16.96	36.8%	B	69.8%	B
16	SAUGUS RIVER / PINES RIVER / LYNN HARBOR	17132	10864	6269	0.0	5870.7	5871	0.0%	A	100.0%	D	0.00	0.30	0.30	0.0%	A	100.0%	D
17	BELLE ISLE CREEK / WINTHROP BAY	3644	3062	582	0.0	1072.9	1152	0.0%	A	93.2%	C	0.00	0.00	0.00	NA	A	NA	A
18	CHELSEA CREEK / MYSTIC RIVER / CHARLES RIVER	16388	13862	2526	565.9	2499.8	2503	22.6%	C	99.9%	C	2.71	5.22	5.25	51.6%	C	99.4%	C
19	NEPONSET RIVER / DORCHESTER BAY	11823	9665	2157	0.0	2651.6	2652	0.0%	A	100.0%	D	1.65	2.28	2.28	72.6%	C	100.0%	D
20	BLACKS CREEK / QUINCY BAY	5331	1825	3506	0.0	3803.6	3804	0.0%	A	100.0%	D	0.00	0.00	0.25	0.0%	A	0.0%	A
21	BACK RIVER / FORE RIVER / HINGHAM BAY	17864	10207	7657	0.0	8823.0	8823	0.0%	A	100.0%	D	0.00	1.65	1.65	0.0%	A	100.0%	D
22	WEIR RIVER / STRAITS POND	3451	2816	635	0.0	529.3	529	0.0%	A	100.0%	D	0.00	0.76	0.76	0.0%	A	100.0%	D
23	BOSTON HARBOR	67679	42415	25264	565.9	27755.1	27838	2.0%	B	99.7%	C	4.36	9.91	10.19	42.8%	B	97.2%	C
24	LITTLE HARBOR	979	838	142	0.0	153.9	154	0.0%	A	100.0%	D	0.00	0.00	0.00	NA	A	NA	A
25	COHASSET HARBOR	4811	4291	520	69.8	651.0	651	10.7%	C	100.0%	D	0.00	0.00	0.35	0.0%	A	0.0%	A
26	SCITUATE HARBOR	1764	1616	148	0.0	206.2	206	0.0%	A	100.0%	D	0.00	0.00	0.00	NA	A	NA	A
27	NORTH RIVER / SOUTH RIVER	13590	12859	730	0.0	920.8	921	0.0%	A	100.0%	D	0.00	0.00	0.99	0.0%	A	0.0%	A
28	GREEN HARBOR	3071	2795	276	0.0	50.2	57	0.0%	A	88.6%	C	4.61	0.00	4.61	100.0%	D	0.0%	A
29	BLUEFISH RIVER / BACK RIVER / DUXBURY BAY	10398	5000	5398	0.0	5298.3	5321	0.0%	A	99.6%	C	0.00	0.00	0.00	NA	A	NA	A
30	JONES RIVER / KINGSTON BAY	7861	4923	2938	0.0	2912.6	2920	0.0%	A	99.8%	C	0.98	0.00	0.98	100.0%	D	0.0%	A
31	EEL RIVER / PLYMOUTH HARBOR	5290	3617	1673	1619.8	1634.7	1635	99.1%	D	100.0%	D	0.00	0.00	2.24	0.0%	A	0.0%	A
32	ELLISVILLE HARBOR	2188	2020	167	0.0	7.5	72	0.0%	A	10.4%	B	0.00	0.00	0.00	NA	A	NA	A
33	GREAT HERRING POND / BOURNEDALE	3498	2885	613	0.0	0.0	583	0.0%	A	0.0%	A	0.00	0.00	0.00	NA	A	NA	A
34	SANDWICH HARBOR	7124	7008	116	45.3	0.0	124	36.5%	C	0.0%	A	0.00	0.00	0.00	NA	A	NA	A
35	SCORTON CREEK	6383	6169	214	0.0	42.2	114	0.0%	A	36.9%	B	0.00	0.10	0.10	0.0%	A	100.0%	D
36	BARNSTABLE HARBOR	20142	18206	1936	0.0	2156.9	2168	0.0%	A	99.5%	C	0.00	**1.09**	1.09	0.0%	A	100.0%	D
37	CHASE GARDEN CREEK	4801	4634	167	0.0	97.6	104	0.0%	A	93.9%	C	0.00	2.01	2.01	0.0%	A	100.0%	D
38	SESUIT CREEK / SESUIT HARBOR	1695	1586	109	0.0	8.0	63	0.0%	A	12.8%	B	0.00	0.00	0.00	NA	A	NA	A
39	QUIVETT CREEK	1470	1447	23	0.0	15.3	15	0.0%	A	100.0%	D	0.00	1.71	1.71	0.0%	A	100.0%	D
40	PAINE'S CREEK / STONY BROOK	3702	3301	401	293.0	0.0	294	99.6%	D	0.0%	A	0.00	0.00	0.00	NA	A	NA	A
41	NAMSKAKET CREEK / LITTLE NAMSKAKET CREEK	2976	2669	307	0.0	16.8	209	0.0%	A	8.1%	B	0.00	1.01	1.01	0.0%	A	100.0%	D
42	BOAT MEADOW CREEK / ROCK HARBOR	1315	1279	37	0.0	40.4	40	0.0%	A	100.0%	D	0.00	1.67	1.67	0.0%	A	100.0%	D
43	HERRING RIVER / HERRING POND	706	652	54	0.0	0.0	42	0.0%	A	0.0%	A	0.00	0.00	0.00	NA	A	NA	A
44	HERRING BROOK / GREAT POND	884	677	207	109.4	0.0	135	81.2%	D	0.0%	A	0.00	0.00	0.00	NA	A	NA	A
45	WELLFLEET HARBOR	17235	12323	4912	0.2	5758.9	5785	0.0%	A	99.6%	C	0.00	0.03	3.63	0.0%	A	0.9%	A
46	PAMET RIVER / LITTLE PAMET RIVER	3453	3399	53	0.0	89.2	89	0.0%	A	100.0%	D	0.00	0.00	0.00	NA	A	NA	A
47	PROVINCETOWN HARBOR	7821	3633	4188	0.0	2774.1	3132	0.0%	A	88.6%	C	0.00	0.00	0.00	NA	A	NA	A

TABLE OF INDICATOR STATISTICS:
STRESSORS (ENTIRE STUDY AREA)

					Crossings/Impoundments							
ID	ESTUARINE WATERSHE NAME	Total Watershed Area	Area of Land (acres)	Area of Open Water (acres)	Number of Impoundments without fish passage structure	Impoundments Ranking	Number of Road Crossings	Number of Road Crossings per square mile	Crossings Ranking	Number of Road Crossings in Tidal Areas	Number of Road Crossings in Tidal Areas per square mile	Tidal Crossings Ranking
1	MERRIMACK RIVER / BLACK ROCK CREEK	12940	11199	1741	2	B	47	2.7	C	25	1.42	C
2	PARKER RIVER	7660	7198	462	4	C	46	4.1	D	24	2.11	D
3	ROWLEY RIVER	3185	2936	249	1	B	13	2.8	C	11	2.38	D
4	IPSWICH RIVER	6024	5637	387	2	B	28	3.1	C	10	1.12	B
5	PLUM ISLAND SOUND	29000	24063	4937	7	C	99	2.6	C	54	1.42	C
6	ESSEX RIVER / ESSEX BAY	12369	10984	1385	2	B	44	2.5	C	25	1.44	C
7	ANNISQUAM RIVER	5649	4883	766	13	D	33	4.3	D	21	2.73	D
8	ROCKPORT HARBOR (SANDY BAY)	2477	1554	923	2	B	4	1.6	B	2	0.82	B
9	GLOUCESTER HARBOR	3115	1602	1513	3	C	5	2.0	B	1	0.40	A
10	MANCHESTER HARBOR	4296	3967	329	4	C	51	8.2	D	17	2.72	D
11	DANVERS RIVER	18346	17740	606	18	D	179	6.4	D	33	1.18	B
12	BEVERLY HARBOR	20573	19379	1194	19	D	213	7.0	D	33	1.08	B
13	FOREST RIVER / SALEM HARBOR	4798	3655	1143	0	A	32	5.6	D	11	1.91	C
14	MARBLEHEAD HARBOR	1143	785	359	0	A	0	0.0	A	0	0.00	A
15	SALEM SOUND	40124	32009	8114	23	D	348	6.9	D	79	1.56	C
16	SAUGUS RIVER / PINES RIVER / LYNN HARBOR	17132	10864	6269	5	C	34	2.0	B	31	1.81	C
17	BELLE ISLE CREEK / WINTHROP BAY	3644	3062	582	0	A	3	0.6	A	3	0.62	A
18	CHELSEA CREEK / MYSTIC RIVER / CHARLES RIVER	16388	13862	2526	12	D	19	0.9	A	7	0.32	A
19	NEPONSET RIVER / DORCHESTER BAY	11823	9665	2157	1	B	9	0.6	A	3	0.20	A
20	BLACKS CREEK / QUINCY BAY	5331	1825	3506	0	A	13	4.5	D	13	4.52	D
21	BACK RIVER / FORE RIVER / HINGHAM BAY	17864	10207	7657	0	A	28	1.7	B	25	1.55	C
22	WEIR RIVER / STRAITS POND	3451	2816	635	2	B	19	4.3	D	8	1.80	C
23	BOSTON HARBOR	67679	42415	25264	15	D	91	1.4	A	59	0.88	B
24	LITTLE HARBOR	979	838	142	1	B	6	4.5	D	5	3.78	D
25	COHASSET HARBOR	4811	4291	520	0	A	21	3.1	C	15	2.22	D
26	SCITUATE HARBOR	1764	1616	148	0	A	10	3.9	C	6	2.35	D
27	NORTH RIVER / SOUTH RIVER	13590	12859	730	12	D	47	2.3	B	25	1.23	C
28	GREEN HARBOR	3071	2795	276	1	B	9	2.0	B	6	1.36	C
29	BLUEFISH RIVER / BACK RIVER / DUXBURY BAY	10398	5000	5398	2	B	18	2.3	B	8	1.01	B
30	JONES RIVER / KINGSTON BAY	7861	4923	2938	10	D	22	2.8	C	11	1.42	C
31	EEL RIVER / PLYMOUTH HARBOR	5290	3617	1673	4	C	18	3.2	C	5	0.88	B
32	ELLISVILLE HARBOR	2188	2020	167	0	A	3	0.9	A	3	0.94	B
33	GREAT HERRING POND / BOURNEDALE	3498	2885	613	0	A	11	2.4	C	0	0.00	A
34	SANDWICH HARBOR	7124	7008	116	4	C	16	1.4	A	10	0.90	B
35	SCORTON CREEK	6383	6169	214	2	B	12	1.2	A	9	0.93	B
36	BARNSTABLE HARBOR	20142	18206	1936	1	B	37	1.3	A	18	0.63	A
37	CHASE GARDEN CREEK	4801	4634	167	1	B	11	1.5	B	7	0.96	B
38	SESUIT CREEK / SESUIT HARBOR	1695	1586	109	0	A	10	4.0	D	9	3.60	D
39	QUIVETT CREEK	1470	1447	23	0	A	3	1.3	A	1	0.44	A
40	PAINE'S CREEK / STONY BROOK	3702	3301	401	0	A	11	2.1	B	10	1.92	D
41	NAMSKAKET CREEK / LITTLE NAMSKAKET CREEK	2976	2669	307	1	B	1	0.2	A	1	0.24	A
42	BOAT MEADOW CREEK / ROCK HARBOR	1315	1279	37	0	A	5	2.5	C	4	1.98	D
43	HERRING RIVER / HERRING POND	706	652	54	0	A	1	1.0	A	1	0.97	B
44	HERRING BROOK / GREAT POND	884	677	207	1	B	3	2.8	C	2	1.87	C
45	WELLFLEET HARBOR	17235	12323	4912	0	A	29	1.5	B	7	0.36	A
46	PAMET RIVER / LITTLE PAMET RIVER	3453	3399	53	0	A	11	2.1	B	3	0.56	A
47	PROVINCETOWN HARBOR	7821	3633	4188	1	B	2	0.3	A	0	0.00	A

TABLE OF INDICATOR STATISTICS:
RESOURCES (ENTIRE STUDY AREA)

Geosyntec Consultants, Inc.

					Salt Marsh Extent			Tidal Flat Extent			Seagrass Extent								
ID	ESTUARINE WATERSHE NAME	Total Watershed Area	Area of Land (acres)	Area of Open Water (acres)	Salt Marsh Extent (acres)	Salt Marsh Extent (% of Watershed Area)	Salt Marsh Extent Ranking	Tidal Flat Extent (acres)	Tidal Flat (% of Watershed Area)	Tidal Flat Extent Ranking	Seagrass Extent (1995) (acres)	Seagrass area per open water area (1995)	Seagrass Extent (2001) (acres)	Seagrass area per open water area (2001)	Seagrass Extent (2006) (acres)	Seagrass area per open water area (2006)	Average Seagrass Acreage	Average Seagrass Acreage per open water area	Seagrass Ranking
1	MERRIMACK RIVER / BLACK ROCK CREEK	12940	11199	1741	3557.7	27.49%	A	910.8	7.04%	A	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0%	D
2	PARKER RIVER	7660	7198	462	2218.6	28.96%	A	3.6	0.05%	D	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0%	D
3	ROWLEY RIVER	3185	2936	249	1345.3	42.24%	A	11.3	0.35%	C	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0%	D
4	IPSWICH RIVER	6024	5637	387	1307.8	21.71%	A	72.6	1.21%	B	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0%	D
5	PLUM ISLAND SOUND	29000	24063	4937	9721.4	33.52%	A	303.0	1.04%	B	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0%	D
6	ESSEX RIVER / ESSEX BAY	12369	10984	1385	3102.7	25.08%	A	725.9	5.87%	A	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0%	D
7	ANNISQUAM RIVER	5649	4883	766	639.3	11.32%	B	380.6	6.74%	A	17.1	0.0	11.4	0.0	14.3	0.0	14.2	1.9%	C
8	ROCKPORT HARBOR (SANDY BAY)	2477	1554	923	0.0	0.00%	D	0.0	0.00%	D	2.5	0.0	2.1	0.0	2.2	0.0	2.3	0.2%	C
9	GLOUCESTER HARBOR	3115	1602	1513	18.2	0.58%	D	1.1	0.03%	D	46.0	0.0	37.2	0.0	59.9	0.0	47.7	3.2%	B
10	MANCHESTER HARBOR	4296	3967	329	13.1	0.31%	D	7.1	0.17%	C	147.7	0.4	116.6	0.4	0.0	0.0	88.1	26.8%	A
11	DANVERS RIVER	18346	17740	606	95.6	0.52%	D	240.5	1.31%	B	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0%	D
12	BEVERLY HARBOR	20573	19379	1194	97.2	0.47%	D	297.8	1.45%	B	72.2	0.1	71.7	0.1	0.0	0.0	48.0	4.0%	B
13	FOREST RIVER / SALEM HARBOR	4798	3655	1143	35.6	0.74%	C	20.8	0.43%	C	103.5	0.1	18.9	0.0	31.1	0.0	51.2	4.5%	B
14	MARBLEHEAD HARBOR	1143	785	359	7.5	0.66%	D	1.2	0.11%	C	25.8	0.1	12.0	0.0	0.0	0.0	12.6	3.5%	B
15	SALEM SOUND	40124	32009	8114	198.0	0.49%	D	352.2	0.88%	C	690.5	0.1	528.1	0.1	35.9	0.0	418.2	5.2%	B
16	SAUGUS RIVER / PINES RIVER / LYNN HARBOR	17132	10864	6269	1011.9	5.91%	B	545.0	3.18%	B	751.3	0.1	667.1	0.1	694.4	0.1	704.3	11.2%	A
17	BELLE ISLE CREEK / WINTHROP BAY	3644	3062	582	366.9	10.07%	B	345.4	9.48%	A	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0%	D
18	CHELSEA CREEK / MYSTIC RIVER / CHARLES RIVER	16388	13862	2526	48.4	0.30%	D	207.3	1.27%	B	0.0	0.0	0.0	0.0	4.5	0.0	1.5	0.1%	C
19	NEPONSET RIVER / DORCHESTER BAY	11823	9665	2157	379.0	3.21%	C	337.3	2.85%	B	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0%	D
20	BLACKS CREEK / QUINCY BAY	5331	1825	3506	163.2	3.06%	C	104.2	1.96%	B	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0%	D
21	BACK RIVER / FORE RIVER / HINGHAM BAY	17864	10207	7657	522.0	2.92%	C	897.1	5.02%	A	180.7	0.0	39.0	0.0	63.8	0.0	94.5	1.2%	C
22	WEIR RIVER / STRAITS POND	3451	2816	635	143.7	4.16%	C	3.2	0.09%	D	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0%	D
23	BOSTON HARBOR	67679	42415	25264	1628.9	2.41%	C	1896.8	2.80%	B	201.5	0.0	66.6	0.0	116.2	0.0	128.1	0.5%	C
24	LITTLE HARBOR	979	838	142	58.4	5.97%	B	47.9	4.89%	A	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0%	D
25	COHASSET HARBOR	4811	4291	520	563.2	11.71%	B	234.6	4.88%	A	113.0	0.2	117.8	0.2	112.1	0.2	114.3	22.0%	A
26	SCITUATE HARBOR	1764	1616	148	103.1	5.84%	B	50.0	2.83%	B	12.0	0.1	10.3	0.1	10.5	0.1	10.9	7.4%	B
27	NORTH RIVER / SOUTH RIVER	13590	12859	730	2359.5	17.36%	A	351.8	2.59%	B	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0%	D
28	GREEN HARBOR	3071	2795	276	137.8	4.49%	C	0.0	0.00%	D	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0%	D
29	BLUEFISH RIVER / BACK RIVER / DUXBURY BAY	10398	5000	5398	1346.7	12.95%	B	389.9	3.75%	A	1443.9	0.3	1243.5	0.2	862.9	0.2	1183.4	21.9%	A
30	JONES RIVER / KINGSTON BAY	7861	4923	2938	233.9	2.98%	C	30.8	0.39%	C	348.4	0.1	312.7	0.1	546.5	0.2	402.5	13.7%	A
31	EEL RIVER / PLYMOUTH HARBOR	5290	3617	1673	31.4	0.59%	D	3.9	0.07%	D	319.7	0.2	252.6	0.2	326.7	0.2	299.7	17.9%	A
32	ELLISVILLE HARBOR	2188	2020	167	67.2	3.07%	C	0.0	0.00%	D	22.8	0.1	21.2	0.1	0.0	0.0	14.7	8.8%	B
33	GREAT HERRING POND / BOURNEDALE	3498	2885	613	0.0	0.00%	D	0.0	0.00%	D	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0%	D
34	SANDWICH HARBOR	7124	7008	116	570.5	8.01%	B	25.5	0.36%	C	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0%	D
35	SCORTON CREEK	6383	6169	214	403.9	6.33%	B	6.5	0.10%	D	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0%	D
36	BARNSTABLE HARBOR	20142	18206	1936	3905.0	19.39%	A	1106.4	5.49%	A	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0%	D
37	CHASE GARDEN CREEK	4801	4634	167	907.7	18.91%	A	46.0	0.96%	B	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0%	D
38	SESUIT CREEK / SESUIT HARBOR	1695	1586	109	61.5	3.63%	C	6.2	0.37%	C	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0%	D
39	QUIVETT CREEK	1470	1447	23	205.5	13.98%	A	12.3	0.83%	C	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0%	D
40	PAINE'S CREEK / STONY BROOK	3702	3301	401	57.1	1.54%	C	0.0	0.00%	D	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0%	D
41	NAMSKAKET CREEK / LITTLE NAMSKAKET CREEK	2976	2669	307	236.1	7.93%	B	10.8	0.36%	C	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0%	D
42	BOAT MEADOW CREEK / ROCK HARBOR	1315	1279	37	262.0	19.92%	A	11.4	0.86%	C	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0%	D
43	HERRING RIVER / HERRING POND	706	652	54	280.6	39.74%	A	29.1	4.12%	A	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0%	D
44	HERRING BROOK / GREAT POND	884	677	207	0.0	0.00%	D	0.0	0.01%	D	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0%	D
45	WELLFLEET HARBOR	17235	12323	4912	1236.0	7.17%	B	1199.8	6.96%	A	3.1	0.0	0.7	0.0	0.0	0.0	1.3	0.0%	C
46	PAMET RIVER / LITTLE PAMET RIVER	3453	3399	53	247.9	7.18%	B	14.2	0.41%	C	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0%	D
47	PROVINCETOWN HARBOR	7821	3633	4188	271.5	3.47%	C	254.7	3.26%	A	903.4	0.2	881.0	0.2	0.0	0.0	594.8	14.2%	A

TABLE OF INDICATOR STATISTICS:
RESOURCES (ENTIRE STUDY AREA)

					Shellfish Habitat (values in acres)													
ID	ESTUARINE WATERSHE NAME	Total Watershed Area	Area of Land (acres)	Area of Open Water (acres)	American Oyster	Bay Scallop	Blue Mussel	European Oyster	Ocean Quahog	Quahog	Razor Clam	Sea Scallop	Soft-shell clam	Surf Clam	Total Shellfish Habitat Area (acres)	Total Shellfish Habitat (species-acres)	Shellfish Habitat per Open Water Area	Shellfish Ranking
1	MERRIMACK RIVER / BLACK ROCK CREEK	12940	11199	1741	0	0	1333	0	0	0	682	0	1250	30	1438.213	3265	187.5%	A
2	PARKER RIVER	7660	7198	462	200	0	0	0	0	0	49	0	220	0	294.1086	468	101.4%	B
3	ROWLEY RIVER	3185	2936	249	1	0	3	0	0	0	196	0	209	0	210.208	410	164.5%	A
4	IPSWICH RIVER	6024	5637	387	1	0	31	0	0	0	27	0	309	0	308.58	367	94.9%	B
5	PLUM ISLAND SOUND	29000	24063	4937	311	0	348	24	0	10	1382	0	2591	702	3194.406	4666	94.5%	B
6	ESSEX RIVER / ESSEX BAY	12369	10984	1385	151	0	244	0	39	8	110	0	1414	193	1461.583	1966	142.0%	A
7	ANNISQUAM RIVER	5649	4883	766	10	0	403	79	132	38	134	0	654	175	902.2139	1451	189.3%	A
8	ROCKPORT HARBOR (SANDY BAY)	2477	1554	923	0	0	195	0	585	0	0	579	5	598	828.8935	1364	147.8%	A
9	GLOUCESTER HARBOR	3115	1602	1513	0	0	135	138	0	5	12	0	56	20	294.3834	346	22.9%	D
10	MANCHESTER HARBOR	4296	3967	329	4	0	68	6	0	15	0	0	31	0	98.63024	124	37.6%	C
11	DANVERS RIVER	18346	17740	606	0	0	70	3	0	29	0	0	340	0	386.9569	442	73.0%	B
12	BEVERLY HARBOR	20573	19379	1194	0	0	204	72	0	98	0	0	477	56	638.4482	852	71.3%	B
13	FOREST RIVER / SALEM HARBOR	4798	3655	1143	0	0	109	131	0	60	1	0	180	0	261.0942	482	42.2%	C
14	MARBLEHEAD HARBOR	1143	785	359	0	0	18	0	0	24	0	0	27	0	44.39786	68	19.0%	D
15	SALEM SOUND	40124	32009	8114	29	0	542	210	0	199	1	740	802	111	2053.756	2523	31.1%	C
16	SAUGUS RIVER / PINES RIVER / LYNN HARBOR	17132	10864	6269	0	0	771	0	0	0	57	0	635	25	1350.984	1463	23.3%	C
17	BELLE ISLE CREEK / WINTHROP BAY	3644	3062	582	0	0	126	0	0	0	0	0	533	0	538.8697	659	113.2%	B
18	CHELSEA CREEK / MYSTIC RIVER / CHARLES RIVER	16388	13862	2526	0	0	84	0	0	0	11	0	212	0	212.4649	308	12.2%	D
19	NEPONSET RIVER / DORCHESTER BAY	11823	9665	2157	0	0	371	0	0	0	147	0	604	0	620.0818	1122	52.0%	C
20	BLACKS CREEK / QUINCY BAY	5331	1825	3506	0	0	527	473	0	64	309	0	643	0	660.2372	2016	57.5%	B
21	BACK RIVER / FORE RIVER / HINGHAM BAY	17864	10207	7657	0	0	1337	303	0	0	252	0	1985	2	2340.081	3877	50.6%	C
22	WEIR RIVER / STRAITS POND	3451	2816	635	0	0	384	0	0	0	0	0	349	0	383.68	733	115.4%	B
23	BOSTON HARBOR	67679	42415	25264	0	0	3094	784	0	64	755	231	4766	2	5438.876	9694	38.4%	C
24	LITTLE HARBOR	979	838	142	0	0	30	0	0	7	0	0	16	0	50.60373	53	37.4%	C
25	COHASSET HARBOR	4811	4291	520	0	0	122	0	0	1	6	0	70	15	201.3611	198	38.1%	C
26	SCITUATE HARBOR	1764	1616	148	0	0	29	0	0	0	0	0	0	0	29.42449	29	19.9%	D
27	NORTH RIVER / SOUTH RIVER	13590	12859	730	12	0	330	0	0	69	116	0	201	0	462.4285	729	99.8%	B
28	GREEN HARBOR	3071	2795	276	0	0	52	0	0	1	5	0	31	118	169.8604	88	32.1%	C
29	BLUEFISH RIVER / BACK RIVER / DUXBURY BAY	10398	5000	5398	73	129	2159	0	0	2208	816	142	1231	651	2890.899	6757	125.2%	A
30	JONES RIVER / KINGSTON BAY	7861	4923	2938	0	0	1646	15	0	1275	105	0	591	450	2202.936	3632	123.6%	A
31	EEL RIVER / PLYMOUTH HARBOR	5290	3617	1673	0	104	612	0	0	192	232	0	295	8	719.5728	1435	85.8%	B
32	ELLISVILLE HARBOR	2188	2020	167	0	0	0	0	0	0	0	0	7	40	46.45324	7	4.1%	D
33	GREAT HERRING POND / BOURNEDALE	3498	2885	613	0	0	0	0	0	0	0	0	0	0		0	0.0%	D
34	SANDWICH HARBOR	7124	7008	116	0	0	23	0	0	35	0	0	59	12	73.05969	117	100.7%	B
35	SCORTON CREEK	6383	6169	214	0	0	9	0	0	22	0	0	22	15	45.78647	54	25.0%	C
36	BARNSTABLE HARBOR	20142	18206	1936	7	119	163	0	0	752	181	0	1751	65	1973.345	2972	153.5%	A
37	CHASE GARDEN CREEK	4801	4634	167	0	0	5	0	0	6	0	0	0	35	35.59804	12	7.0%	D
38	SESUIT CREEK / SESUIT HARBOR	1695	1586	109	7	0	14	0	0	15	0	0	4	0	31.05756	39	36.1%	C
39	QUIVETT CREEK	1470	1447	23	15	0	15	0	0	15	0	0	0	0	15.42633	46	199.0%	A
40	PAINE'S CREEK / STONY BROOK	3702	3301	401	4	0	4	0	0	4	0	0	0	0	3.887384	12	2.9%	D
41	NAMSKAKET CREEK / LITTLE NAMSKAKET CREEK	2976	2669	307	0	0	0	0	0	2	0	0	21	0	20.5378	23	7.5%	D
42	BOAT MEADOW CREEK / ROCK HARBOR	1315	1279	37	45	0	0	0	0	45	0	0	45	0	44.69779	134	364.0%	A
43	HERRING RIVER / HERRING POND	706	652	54	38	0	0	0	0	38	2	0	38	0	39.49982	115	214.0%	A
44	HERRING BROOK / GREAT POND	884	677	207	0	0	0	0	0	0	0	0	0	0		0	0.0%	D
45	WELLFLEET HARBOR	17235	12323	4912	1692	3425	7	0	0	4789	28	0	427	325	5396.97	10368	211.1%	A
46	PAMET RIVER / LITTLE PAMET RIVER	3453	3399	53	6	0	1	0	0	30	0	0	22	0	48.96253	59	110.6%	B
47	PROVINCETOWN HARBOR	7821	3633	4188	17	22	17	0	0	677	0	0	126	2217	2966.495	860	20.5%	D

					Shorebird Habitat (values in acres)																Shorebird Habitat (values in acres)
ID	ESTUARINE WATERSHE NAME	Total Watershed Area	Area of Land (acres)	Area of Open Water (acres)	American bittern	American black duck	Arctic tern	Bald eagle	Black-bellied plover	Black-crowned night-heron	Brant	Canada goose	Common moorhen	Common tern	Diving ducks	Double-crested cormorant	Dunlin	Eiders	Great black-backed gull	Great egret	Harlequin duck
1	MERRIMACK RIVER / BLACK ROCK CREEK	12940	11199	1741	734	1625	0	1632	890	0	0	734	734	2798	0	0	890	0	0	0	0
2	PARKER RIVER	7660	7198	462	317	317	0	0	0	0	0	317	317	317	0	0	0	0	0	0	0
3	ROWLEY RIVER	3185	2936	249	891	891	0	0	0	0	0	891	891	891	0	0	0	0	0	0	0
4	IPSWICH RIVER	6024	5637	387	397	1346	0	0	0	0	0	397	397	1346	0	0	0	0	0	0	0
5	PLUM ISLAND SOUND	29000	24063	4937	6847	7796	0	0	0	0	0	6847	6847	7796	0	0	0	0	0	0	0
6	ESSEX RIVER / ESSEX BAY	12369	10984	1385	0	3108	0	0	0	0	0	0	0	3108	0	0	0	0	0	0	0
7	ANNISQUAM RIVER	5649	4883	766	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8	ROCKPORT HARBOR (SANDY BAY)	2477	1554	923	0	0	0	0	0	0	0	0	0	0	0	0	0	620	0	0	2
9	GLOUCESTER HARBOR	3115	1602	1513	0	0	0	0	0	0	0	0	0	0	0	0	0	61	0	0	0
10	MANCHESTER HARBOR	4296	3967	329	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	DANVERS RIVER	18346	17740	606	0	929	0	0	0	0	0	929	0	0	0	0	0	0	0	0	0
12	BEVERLY HARBOR	20573	19379	1194	0	1010	0	0	0	0	0	1010	0	0	0	0	0	0	0	0	0
13	FOREST RIVER / SALEM HARBOR	4798	3655	1143	0	0	0	0	0	0	0	0	0	0	848	0	0	0	0	0	0
14	MARBLEHEAD HARBOR	1143	785	359	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	SALEM SOUND	40124	32009	8114	0	1010	0	0	0	0	0	1010	0	0	848	0	0	0	0	0	0
16	SAUGUS RIVER / PINES RIVER / LYNN HARBOR	17132	10864	6269	0	127	0	0	0	0	0	0	0	142	0	0	0	1528	0	0	0
17	BELLE ISLE CREEK / WINTHROP BAY	3644	3062	582	0	0	0	0	0	0	0	0	0	25	0	0	0	0	0	0	0
18	CHELSEA CREEK / MYSTIC RIVER / CHARLES RIVER	16388	13862	2526	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19	NEPONSET RIVER / DORCHESTER BAY	11823	9665	2157	0	140	0	0	0	0	140	0	0	0	0	0	0	0	0	0	0
20	BLACKS CREEK / QUINCY BAY	5331	1825	3506	0	113	0	0	0	0	113	0	0	0	0	0	0	0	0	0	0
21	BACK RIVER / FORE RIVER / HINGHAM BAY	17864	10207	7657	0	0	0	0	0	4	0	0	0	13	0	4	0	183	4	4	0
22	WEIR RIVER / STRAITS POND	3451	2816	635	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23	BOSTON HARBOR	67679	42415	25264	0	252	0	0	0	4	252	0	0	37	0	4	0	405	4	4	0
24	LITTLE HARBOR	979	838	142	0	165	0	0	0	0	0	165	0	0	0	0	0	0	0	0	0
25	COHASSET HARBOR	4811	4291	520	0	0	0	0	0	0	0	0	0	0	0	0	0	76	0	0	0
26	SCITUATE HARBOR	1764	1616	148	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
27	NORTH RIVER / SOUTH RIVER	13590	12859	730	0	605	0	0	0	0	0	0	0	0	0	0	0	327	0	0	0
28	GREEN HARBOR	3071	2795	276	0	0	0	0	0	0	0	0	1197	0	0	0	0	0	0	0	0
29	BLUEFISH RIVER / BACK RIVER / DUXBURY BAY	10398	5000	5398	0	5444	0	0	0	0	5444	0	0	0	0	0	0	5444	0	0	0
30	JONES RIVER / KINGSTON BAY	7861	4923	2938	0	2863	0	0	0	0	2863	0	0	0	0	0	0	2863	0	0	0
31	EEL RIVER / PLYMOUTH HARBOR	5290	3617	1673	0	1633	7	0	0	0	1633	0	0	7	0	0	0	1633	0	0	0
32	ELLISVILLE HARBOR	2188	2020	167	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
33	GREAT HERRING POND / BOURNEDALE	3498	2885	613	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
34	SANDWICH HARBOR	7124	7008	116	0	0	0	0	0	0	0	0	0	406	0	0	0	0	0	0	0
35	SCORTON CREEK	6383	6169	214	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
36	BARNSTABLE HARBOR	20142	18206	1936	0	6907	0	0	0	0	0	6907	0	42	0	0	0	6907	0	0	0
37	CHASE GARDEN CREEK	4801	4634	167	0	1187	0	0	0	0	0	1187	0	63	0	0	0	1187	0	0	0
38	SESUIT CREEK / SESUIT HARBOR	1695	1586	109	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
39	QUIVETT CREEK	1470	1447	23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
40	PAINE'S CREEK / STONY BROOK	3702	3301	401	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
41	NAMSKAKET CREEK / LITTLE NAMSKAKET CREEK	2976	2669	307	0	0	0	0	0	0	22	22	0	0	0	0	0	0	0	0	0
42	BOAT MEADOW CREEK / ROCK HARBOR	1315	1279	37	0	0	0	0	0	0	46	46	0	0	0	0	0	0	0	0	0
43	HERRING RIVER / HERRING POND	706	652	54	0	0	0	0	0	0	52	52	0	0	0	0	0	0	0	0	0
44	HERRING BROOK / GREAT POND	884	677	207	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
45	WELLFLEET HARBOR	17235	12323	4912	0	2468	0	0	0	0	287	0	0	0	0	0	0	287	0	0	0
46	PAMET RIVER / LITTLE PAMET RIVER	3453	3399	53	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
47	PROVINCETOWN HARBOR	7821	3633	4188	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

TABLE OF INDICATOR STATISTICS:
RESOURCES (ENTIRE STUDY AREA)

					Shorebird Habitat (values in acres)													
ID	ESTUARINE WATERSHE NAME	Total Watershed Area	Area of Land (acres)	Area of Open Water (acres)	Herring gull	Hudsonian godwit	King rail	Least bittern	Least tern	Lesser yellowlegs	Little blue heron	Mallard	Pied-billed grebe	Piping plover	Red knot	Roseate tern	Scoters	Semipalmated sandpiper
1	MERRIMACK RIVER / BLACK ROCK CREEK	12940	11199	1741	0	55	1691	734	1	890	0	0	734	1	890	0	0	890
2	PARKER RIVER	7660	7198	462	0	0	317	317	0	0	0	0	317	0	0	0	0	0
3	ROWLEY RIVER	3185	2936	249	0	0	891	891	0	0	0	0	891	0	0	0	0	0
4	IPSWICH RIVER	6024	5637	387	0	0	397	397	30	0	0	0	397	30	0	0	0	0
5	PLUM ISLAND SOUND	29000	24063	4937	0	0	6847	6847	227	0	0	0	6847	227	0	0	0	0
6	ESSEX RIVER / ESSEX BAY	12369	10984	1385	0	0	0	0	28	0	0	0	0	28	0	0	0	0
7	ANNISQUAM RIVER	5649	4883	766	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8	ROCKPORT HARBOR (SANDY BAY)	2477	1554	923	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9	GLOUCESTER HARBOR	3115	1602	1513	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10	MANCHESTER HARBOR	4296	3967	329	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	DANVERS RIVER	18346	17740	606	0	0	0	0	0	0	0	929	0	0	0	0	0	0
12	BEVERLY HARBOR	20573	19379	1194	0	0	0	0	0	0	0	1010	0	0	0	0	0	0
13	FOREST RIVER / SALEM HARBOR	4798	3655	1143	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	MARBLEHEAD HARBOR	1143	785	359	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	SALEM SOUND	40124	32009	8114	0	0	0	0	0	0	0	1010	0	0	0	0	0	0
16	SAUGUS RIVER / PINES RIVER / LYNN HARBOR	17132	10864	6269	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17	BELLE ISLE CREEK / WINTHROP BAY	3644	3062	582	0	0	0	0	25	0	0	0	0	25	0	0	0	0
18	CHELSEA CREEK / MYSTIC RIVER / CHARLES RIVER	16388	13862	2526	0	0	0	0	6	0	0	0	0	0	0	0	0	0
19	NEPONSET RIVER / DORCHESTER BAY	11823	9665	2157	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20	BLACKS CREEK / QUINCY BAY	5331	1825	3506	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21	BACK RIVER / FORE RIVER / HINGHAM BAY	17864	10207	7657	4	0	0	0	0	0	4	0	0	0	0	0	0	0
22	WEIR RIVER / STRAITS POND	3451	2816	635	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23	BOSTON HARBOR	67679	42415	25264	4	0	0	0	50	0	4	0	0	25	0	0	0	0
24	LITTLE HARBOR	979	838	142	0	0	0	0	0	0	0	165	0	0	0	0	0	0
25	COHASSET HARBOR	4811	4291	520	0	0	0	0	0	0	0	0	0	0	0	0	76	0
26	SCITUATE HARBOR	1764	1616	148	0	0	0	0	0	0	0	0	0	0	0	0	0	0
27	NORTH RIVER / SOUTH RIVER	13590	12859	730	0	0	0	0	164	0	0	605	0	164	112	0	0	0
28	GREEN HARBOR	3071	2795	276	0	0	0	1197	0	0	0	0	0	0	0	0	0	0
29	BLUEFISH RIVER / BACK RIVER / DUXBURY BAY	10398	5000	5398	0	0	0	0	116	0	0	0	0	116	0	0	5444	0
30	JONES RIVER / KINGSTON BAY	7861	4923	2938	0	0	0	0	2	0	0	0	0	2	0	0	2863	0
31	EEL RIVER / PLYMOUTH HARBOR	5290	3617	1673	0	0	0	0	35	0	0	0	0	35	162	7	1633	0
32	ELLISVILLE HARBOR	2188	2020	167	0	0	0	0	4	0	0	0	0	4	0	0	0	0
33	GREAT HERRING POND / BOURNEDALE	3498	2885	613	0	0	0	0	0	0	0	0	0	0	0	0	0	0
34	SANDWICH HARBOR	7124	7008	116	0	0	0	0	30	0	0	0	0	30	0	0	0	0
35	SCORTON CREEK	6383	6169	214	0	0	0	0	43	0	0	0	0	43	0	0	0	0
36	BARNSTABLE HARBOR	20142	18206	1936	0	0	0	0	4929	0	0	0	0	6	0	0	0	0
37	CHASE GARDEN CREEK	4801	4634	167	0	0	0	0	8	0	0	0	0	8	0	21	0	0
38	SESUIT CREEK / SESUIT HARBOR	1695	1586	109	0	0	0	0	0	0	0	0	0	0	0	0	0	0
39	QUIVETT CREEK	1470	1447	23	0	0	0	0	0	0	0	0	0	0	0	0	0	0
40	PAINE'S CREEK / STONY BROOK	3702	3301	401	0	0	0	0	0	0	0	0	0	0	0	0	0	0
41	NAMSKAKET CREEK / LITTLE NAMSKAKET CREEK	2976	2669	307	0	0	0	0	0	0	0	0	0	0	0	0	0	0
42	BOAT MEADOW CREEK / ROCK HARBOR	1315	1279	37	0	0	0	0	0	0	0	0	0	0	0	0	0	0
43	HERRING RIVER / HERRING POND	706	652	54	0	0	0	0	0	0	0	0	0	0	0	0	0	0
44	HERRING BROOK / GREAT POND	884	677	207	0	0	0	0	0	0	0	0	0	0	0	0	0	0
45	WELLFLEET HARBOR	17235	12323	4912	0	0	0	0	25	0	0	0	0	25	0	0	0	0
46	PAMET RIVER / LITTLE PAMET RIVER	3453	3399	53	0	0	0	0	9	0	0	0	0	9	0	0	0	0
47	PROVINCETOWN HARBOR	7821	3633	4188	0	0	0	0	200	0	0	0	0	200	0	0	0	0

TABLE OF INDICATOR STATISTICS:
RESOURCES (ENTIRE STUDY AREA)

													Anadromous Fish Run Length						
ID	ESTUARINE WATERSHE NAME	Total Watershed Area	Area of Land (acres)	Area of Open Water (acres)	Shorebirds	Short-billed dowitcher	Snowy egret	Wading birds	Waterfowl	Total Shorebird Habitat (species-acres)	Total Shorebird Habitat per Watershed Area (species-acres)	Shorebird Habitat Ranking	Alewife	American Shad	Atlantic Sturgeon	Blueback Herring	Rainbow Smelt	Total Miles	Anadromous Fish Run Ranking
1	MERRIMACK RIVER / BLACK ROCK CREEK	12940	11199	1741	895	890	0	0	1632	19342	149.5%	A	64.00	0.00	28.60	0.00	12.60	105.20	A
2	PARKER RIVER	7660	7198	462	43	0	0	0	0	2575	33.6%	B	16.98	0.00	0.00	9.46	4.19	30.64	A
3	ROWLEY RIVER	3185	2936	249	41	0	0	0	0	7170	225.1%	A	6.33	0.00	0.00	0.00	6.60	12.93	A
4	IPSWICH RIVER	6024	5637	387	212	0	0	0	0	5343	88.7%	A	0.00	0.00	0.00	8.40	0.00	8.40	A
5	PLUM ISLAND SOUND	29000	24063	4937	1615	0	0	0	0	58743	202.6%	A	23.31	0.00	0.00	17.87	10.80	51.98	A
6	ESSEX RIVER / ESSEX BAY	12369	10984	1385	911	0	0	0	208	7391	59.8%	A	5.52	0.00	0.00	0.00	3.44	8.96	A
7	ANNISQUAM RIVER	5649	4883	766	0	0	0	0	0	0	0.0%	D	1.72	0.00	0.00	0.00	0.00	1.72	C
8	ROCKPORT HARBOR (SANDY BAY)	2477	1554	923	0	0	0	0	0	622	25.1%	B	0.00	0.00	0.00	0.00	0.00	0.00	D
9	GLOUCESTER HARBOR	3115	1602	1513	0	0	0	0	0	61	2.0%	C	0.00	0.00	0.00	0.00	0.00	0.00	D
10	MANCHESTER HARBOR	4296	3967	329	0	0	0	0	0	0	0.0%	D	0.00	0.00	0.00	0.00	0.59	0.59	C
11	DANVERS RIVER	18346	17740	606	0	0	0	0	0	2786	15.2%	B	3.58	0.00	0.00	0.00	1.48	5.06	B
12	BEVERLY HARBOR	20573	19379	1194	0	0	0	0	0	3030	14.7%	B	3.58	0.00	0.00	0.00	1.48	5.06	B
13	FOREST RIVER / SALEM HARBOR	4798	3655	1143	0	0	0	0	0	848	17.7%	B	0.00	0.00	0.00	0.00	0.00	0.00	D
14	MARBLEHEAD HARBOR	1143	785	359	0	0	0	0	0	0	0.0%	D	0.00	0.00	0.00	0.00	0.00	0.00	D
15	SALEM SOUND	40124	32009	8114	0	0	0	0	0	3878	9.7%	B	3.58	0.00	0.00	0.00	2.43	6.01	B
16	SAUGUS RIVER / PINES RIVER / LYNN HARBOR	17132	10864	6269	0	0	0	0	0	1798	10.5%	B	0.00	0.00	0.00	0.00	4.21	4.21	B
17	BELLE ISLE CREEK / WINTHROP BAY	3644	3062	582	0	0	0	0	0	74	2.0%	C	0.00	0.00	0.00	0.00	0.00	0.00	D
18	CHELSEA CREEK / MYSTIC RIVER / CHARLES RIVER	16388	13862	2526	0	0	0	0	0	6	0.0%	D	7.50	20.52	0.00	0.00	9.56	37.58	A
19	NEPONSET RIVER / DORCHESTER BAY	11823	9665	2157	0	0	0	0	0	279	2.4%	C	0.00	4.35	0.00	0.00	0.97	5.32	B
20	BLACKS CREEK / QUINCY BAY	5331	1825	3506	0	0	0	0	0	225	4.2%	C	0.00	0.00	0.00	0.00	1.24	1.24	C
21	BACK RIVER / FORE RIVER / HINGHAM BAY	17864	10207	7657	0	0	4	529	0	751	4.2%	C	5.23	0.00	0.00	0.00	11.72	16.95	A
22	WEIR RIVER / STRAITS POND	3451	2816	635	0	0	0	261	0	261	7.6%	B	4.20	0.00	0.00	0.00	1.75	5.95	B
23	BOSTON HARBOR	67679	42415	25264	0	0	4	790	0	1837	2.7%	C	16.93	24.88	0.00	0.00	25.23	67.04	A
24	LITTLE HARBOR	979	838	142	0	0	0	0	0	495	50.5%	A	0.00	0.00	0.00	0.00	0.00	0.00	D
25	COHASSET HARBOR	4811	4291	520	0	0	0	0	0	152	3.2%	C	4.27	0.00	0.00	0.00	0.39	4.66	B
26	SCITUATE HARBOR	1764	1616	148	0	0	0	0	0	0	0.0%	D	0.00	0.00	0.00	0.00	0.09	0.09	C
27	NORTH RIVER / SOUTH RIVER	13590	12859	730	112	0	0	0	0	2090	15.4%	B	23.60	0.00	0.00	0.00	13.71	37.31	A
28	GREEN HARBOR	3071	2795	276	0	0	0	0	0	2394	78.0%	A	0.00	0.00	0.00	0.00	0.00	0.00	D
29	BLUEFISH RIVER / BACK RIVER / DUXBURY BAY	10398	5000	5398	3176	0	0	0	0	25185	242.2%	A	1.30	0.00	0.00	0.00	0.00	1.30	C
30	JONES RIVER / KINGSTON BAY	7861	4923	2938	1996	0	0	0	0	13452	171.1%	A	7.11	3.06	0.00	0.00	1.40	11.57	A
31	EEL RIVER / PLYMOUTH HARBOR	5290	3617	1673	641	0	0	0	0	7427	140.4%	A	5.91	0.00	0.00	1.72	0.91	8.53	A
32	ELLISVILLE HARBOR	2188	2020	167	0	0	0	0	0	9	0.4%	D	0.00	0.00	0.00	0.00	0.00	0.00	D
33	GREAT HERRING POND / BOURNEDALE	3498	2885	613	0	0	0	0	0	0	0.0%	D	3.86	0.00	0.00	3.44	0.00	7.30	B
34	SANDWICH HARBOR	7124	7008	116	0	0	0	0	0	465	6.5%	C	2.36	1.41	0.00	0.00	0.00	3.76	B
35	SCORTON CREEK	6383	6169	214	0	0	0	0	0	87	1.4%	C	0.00	0.00	0.00	0.00	0.00	0.00	D
36	BARNSTABLE HARBOR	20142	18206	1936	0	0	0	0	0	25698	127.6%	A	2.50	0.00	0.00	0.00	0.00	2.50	C
37	CHASE GARDEN CREEK	4801	4634	167	0	0	0	0	0	3660	76.2%	A	0.00	0.00	0.00	0.00	0.00	0.00	D
38	SESUIT CREEK / SESUIT HARBOR	1695	1586	109	0	0	0	0	0	0	0.0%	D	2.85	0.00	0.00	0.00	0.00	2.85	C
39	QUIVETT CREEK	1470	1447	23	0	0	0	0	0	0	0.0%	D	2.53	0.00	0.00	0.00	0.00	2.53	C
40	PAINE'S CREEK / STONY BROOK	3702	3301	401	0	0	0	0	0	0	0.0%	D	3.87	0.00	0.00	1.56	0.00	5.42	B
41	NAMSKAKET CREEK / LITTLE NAMSKAKET CREEK	2976	2669	307	22	0	0	0	0	66	2.2%	C	0.00	0.00	0.00	0.00	0.00	0.00	D
42	BOAT MEADOW CREEK / ROCK HARBOR	1315	1279	37	46	0	0	0	0	137	10.4%	B	1.77	0.00	0.00	0.00	0.00	1.77	C
43	HERRING RIVER / HERRING POND	706	652	54	52	0	0	0	0	155	21.9%	B	1.42	0.00	0.00	0.00	0.00	1.42	C
44	HERRING BROOK / GREAT POND	884	677	207	0	0	0	0	0	0	0.0%	D	1.25	0.00	0.00	0.00	0.00	1.25	C
45	WELLFLEET HARBOR	17235	12323	4912	2468	0	0	0	0	5560	32.3%	B	5.81	0.00	0.00	0.00	0.00	5.81	B
46	PAMET RIVER / LITTLE PAMET RIVER	3453	3399	53	0	0	0	0	0	19	0.5%	C	5.53	0.00	0.00	0.00	0.00	5.53	B
47	PROVINCETOWN HARBOR	7821	3633	4188	0	0	0	0	0	399	5.1%	C	1.17	0.00	0.00	0.00	0.00	1.17	C

TABLE OF INDICATOR STATISTICS:
RESOURCES (ENTIRE STUDY AREA)

					Shorebird Nesting Sites													
ID	ESTUARINE WATERSHE NAME	Total Watershed Area	Area of Land (acres)	Area of Open Water (acres)	American black duck	Black-crowned night-heron	Canada goose	Colonial waterbirds	Common tern	Double-crested cormorant	Great black-backed gull	Herring gull	Laughing gull	Least tern	Yellow-crowned night-heron	Total Nesting Sites	Nesting Sites per Acre	Nesting Site Ranking
1	MERRIMACK RIVER / BLACK ROCK CREEK	12940	11199	1741	0	0	0	0	0	0	0	1	0	0	0	1	0.00008	C
2	PARKER RIVER	7660	7198	462	0	0	0	0	0	0	0	0	0	0	0	0	0.00000	D
3	ROWLEY RIVER	3185	2936	249	0	0	0	0	0	0	0	0	0	0	0	0	0.00000	D
4	IPSWICH RIVER	6024	5637	387	0	0	0	0	0	0	0	0	0	0	0	0	0.00000	D
5	PLUM ISLAND SOUND	29000	24063	4937	0	0	0	0	0	0	0	0	0	0	0	0	0.00000	D
6	ESSEX RIVER / ESSEX BAY	12369	10984	1385	0	0	0	0	0	0	0	0	0	0	0	0	0.00000	D
7	ANNISQUAM RIVER	5649	4883	766	0	0	0	0	0	0	0	0	0	0	0	0	0.00000	D
8	ROCKPORT HARBOR (SANDY BAY)	2477	1554	923	0	0	0	0	0	0	0	0	0	0	0	0	0.00000	D
9	GLOUCESTER HARBOR	3115	1602	1513	0	0	0	0	0	0	1	1	0	0	0	2	0.00064	A
10	MANCHESTER HARBOR	4296	3967	329	0	0	1	0	0	0	1	0	0	0	0	2	0.00047	A
11	DANVERS RIVER	18346	17740	606	0	0	0	0	0	0	0	0	0	0	0	0	0.00000	D
12	BEVERLY HARBOR	20573	19379	1194	0	0	0	0	0	0	0	0	0	0	0	0	0.00000	D
13	FOREST RIVER / SALEM HARBOR	4798	3655	1143	0	0	0	0	0	0	0	0	0	0	0	0	0.00000	D
14	MARBLEHEAD HARBOR	1143	785	359	0	0	0	0	0	0	0	0	0	0	0	0	0.00000	D
15	SALEM SOUND	40124	32009	8114	0	1	1	2	0	3	4	3	0	0	0	14	0.00035	B
16	SAUGUS RIVER / PINES RIVER / LYNN HARBOR	17132	10864	6269	0	0	0	0	1	0	0	0	0	0	0	1	0.00006	C
17	BELLE ISLE CREEK / WINTHROP BAY	3644	3062	582	0	0	0	0	0	0	0	0	0	0	0	0	0.00000	D
18	CHELSEA CREEK / MYSTIC RIVER / CHARLES RIVER	16388	13862	2526	0	0	0	0	0	0	2	2	0	0	0	4	0.00024	C
19	NEPONSET RIVER / DORCHESTER BAY	11823	9665	2157	0	0	0	0	0	0	2	2	0	0	0	4	0.00034	B
20	BLACKS CREEK / QUINCY BAY	5331	1825	3506	0	0	0	0	0	0	1	1	0	0	0	2	0.00038	A
21	BACK RIVER / FORE RIVER / HINGHAM BAY	17864	10207	7657	1	2	0	0	0	0	2	4	0	0	1	10	0.00056	A
22	WEIR RIVER / STRAITS POND	3451	2816	635	0	0	0	0	0	0	0	0	0	0	0	0	0.00000	D
23	BOSTON HARBOR	67679	42415	25264	1	2	0	1	1	0	7	9	0	0	1	22	0.00033	B
24	LITTLE HARBOR	979	838	142	0	0	0	0	0	0	0	0	0	0	0	0	0.00000	D
25	COHASSET HARBOR	4811	4291	520	0	0	0	0	0	0	1	1	0	0	0	2	0.00042	A
26	SCITUATE HARBOR	1764	1616	148	0	0	0	0	0	0	0	0	0	0	0	0	0.00000	D
27	NORTH RIVER / SOUTH RIVER	13590	12859	730	0	0	0	0	0	0	0	0	0	0	0	0	0.00000	D
28	GREEN HARBOR	3071	2795	276	0	0	0	0	0	0	0	0	0	0	0	0	0.00000	D
29	BLUEFISH RIVER / BACK RIVER / DUXBURY BAY	10398	5000	5398	0	0	0	0	0	1	1	1	0	0	0	3	0.00029	B
30	JONES RIVER / KINGSTON BAY	7861	4923	2938	0	0	0	0	0	0	0	0	0	0	0	0	0.00000	D
31	EEL RIVER / PLYMOUTH HARBOR	5290	3617	1673	0	0	0	0	0	0	1	1	1	1	0	4	0.00076	A
32	ELLISVILLE HARBOR	2188	2020	167	0	0	0	0	0	0	0	0	0	0	0	0	0.00000	D
33	GREAT HERRING POND / BOURNEDALE	3498	2885	613	0	0	0	0	0	0	0	0	0	0	0	0	0.00000	D
34	SANDWICH HARBOR	7124	7008	116	0	0	0	0	0	0	0	0	0	0	0	0	0.00000	D
35	SCORTON CREEK	6383	6169	214	0	0	0	0	0	0	0	0	0	0	0	0	0.00000	D
36	BARNSTABLE HARBOR	20142	18206	1936	0	0	0	0	0	0	0	0	0	0	0	0	0.00000	D
37	CHASE GARDEN CREEK	4801	4634	167	0	0	0	0	0	0	0	0	0	0	0	0	0.00000	D
38	SESUIT CREEK / SESUIT HARBOR	1695	1586	109	0	0	0	0	0	0	0	0	0	0	0	0	0.00000	D
39	QUIVETT CREEK	1470	1447	23	0	0	0	0	0	0	0	0	0	0	0	0	0.00000	D
40	PAINE'S CREEK / STONY BROOK	3702	3301	401	0	0	0	0	0	0	0	0	0	0	0	0	0.00000	D
41	NAMSKAKET CREEK / LITTLE NAMSKAKET CREEK	2976	2669	307	0	0	0	0	0	0	0	0	0	0	0	0	0.00000	D
42	BOAT MEADOW CREEK / ROCK HARBOR	1315	1279	37	0	0	0	0	0	0	0	0	0	0	0	0	0.00000	D
43	HERRING RIVER / HERRING POND	706	652	54	0	0	0	0	0	0	0	0	0	0	0	0	0.00000	D
44	HERRING BROOK / GREAT POND	884	677	207	0	0	0	0	0	0	0	0	0	0	0	0	0.00000	D
45	WELLFLEET HARBOR	17235	12323	4912	0	0	0	0	0	0	0	0	0	0	0	0	0.00000	D
46	PAMET RIVER / LITTLE PAMET RIVER	3453	3399	53	0	0	0	0	0	0	0	0	0	0	0	0	0.00000	D
47	PROVINCETOWN HARBOR	7821	3633	4188	0	0	0	0	0	1	0	0	0	0	0	1	0.00013	C

TABLE OF INDICATOR STATISTICS:
STRESSORS (REGIONAL ANALYSIS)

					High Intensity Land Use			Stormwater Runoff			Imperviousness		
ID	ESTUARINE WATERSHE NAME	Total Watershed Area	Area of Land (acres)	Area of Open Water (acres)	High Intensity Land Use (acres)	High Intensity Land Use (% of Land Area)	High Intensity Land Use Ranking	Estimated Stormwater Volume (ac-ft/yr)	Estimated Stormwater Volume (in/yr)	Stormwater Runoff Ranking	Impervious Area (acres)	Impervious Area (%)	Impervious Area Ranking
1	MERRIMACK RIVER / BLACK ROCK CREEK	12940	11199	1741	3050.7	27.2%	B	3699	3.96	B	1406.4	12.6%	C
2	PARKER RIVER	7660	7198	462	1553.7	21.6%	B	2398	4.00	C	340.8	4.7%	A
3	ROWLEY RIVER	3185	2936	249	413.0	14.1%	A	852	3.48	A	141.4	4.8%	A
4	IPSWICH RIVER	6024	5637	387	1997.5	35.4%	C	2092	4.45	C	487.3	8.6%	B
5	PLUM ISLAND SOUND	29000	24063	4937	4836.5	20.1%	B	7657	3.82	B	1194.7	5.0%	B
6	ESSEX RIVER / ESSEX BAY	12369	10984	1385	1888.4	17.2%	A	2575	2.81	A	468.4	4.3%	A
7	ANNISQUAM RIVER	5649	4883	766	1535.4	31.4%	C	1797	4.42	C	667.7	13.7%	C
8	ROCKPORT HARBOR (SANDY BAY)	2477	1554	923	740.1	47.6%	D	640	4.94	D	302.6	19.5%	D
9	GLOUCESTER HARBOR	3115	1602	1513	911.6	56.9%	D	1013	7.59	D	463.7	28.9%	D
10	MANCHESTER HARBOR	4296	3967	329	1115.4	28.1%	A	1185	3.58	A	429.7	10.8%	A
11	DANVERS RIVER	18346	17740	606	11936.0	67.3%	C	12685	8.58	C	6138.6	34.6%	C
12	BEVERLY HARBOR	20573	19379	1194	13043.9	67.3%	C	13616	8.43	C	6699.0	34.6%	C
13	FOREST RIVER / SALEM HARBOR	4798	3655	1143	2246.2	61.5%	B	2734	8.98	D	1455.9	39.8%	D
14	MARBLEHEAD HARBOR	1143	785	359	679.2	86.6%	D	775	11.85	D	352.5	44.9%	D
15	SALEM SOUND	40124	32009	8114	18503.8	57.8%	A	18482	6.93	B	9473.7	29.6%	B
16	SAUGUS RIVER / PINES RIVER / LYNN HARBOR	17132	10864	6269	7161.5	65.9%	B	8635	9.54	B	4704.2	43.3%	C
17	BELLE ISLE CREEK / WINTHROP BAY	3644	3062	582	2146.6	70.1%	C	3241	12.70	D	1246.0	40.7%	B
18	CHELSEA CREEK / MYSTIC RIVER / CHARLES RIVER	16388	13862	2526	12621.4	91.0%	D	16758	14.51	D	9758.0	70.4%	D
19	NEPONSET RIVER / DORCHESTER BAY	11823	9665	2157	7912.7	81.9%	D	9790	12.15	C	5340.4	55.3%	D
20	BLACKS CREEK / QUINCY BAY	5331	1825	3506	1091.4	59.8%	B	933	6.13	A	551.7	30.2%	B
21	BACK RIVER / FORE RIVER / HINGHAM BAY	17864	10207	7657	5861.0	57.4%	A	5276	6.20	B	2966.2	29.1%	A
22	WEIR RIVER / STRAITS POND	3451	2816	635	1078.8	38.3%	A	969	4.13	A	426.6	15.1%	A
23	BOSTON HARBOR	67679	42415	25264	31035.6	73.2%	C	37331	10.56	C	20501.2	48.3%	C
24	LITTLE HARBOR	979	838	142	350.3	41.8%	C	287	4.12	B	77.6	9.3%	A
25	COHASSET HARBOR	4811	4291	520	1986.2	46.3%	C	1513	4.23	B	573.5	13.4%	C
26	SCITUATE HARBOR	1764	1616	148	915.8	56.7%	D	721	5.35	D	292.6	18.1%	D
27	NORTH RIVER / SOUTH RIVER	13590	12859	730	4220.2	32.8%	B	3693	3.45	B	1336.8	10.4%	B
28	GREEN HARBOR	3071	2795	276	1086.8	38.9%	B	1254	5.38	D	416.4	14.9%	C
29	BLUEFISH RIVER / BACK RIVER / DUXBURY BAY	10398	5000	5398	1582.9	31.7%	B	1027	2.46	A	487.6	9.8%	A
30	JONES RIVER / KINGSTON BAY	7861	4923	2938	2460.0	50.0%	C	1943	4.74	C	979.2	19.9%	D
31	EEL RIVER / PLYMOUTH HARBOR	5290	3617	1673	2004.8	55.4%	D	1319	4.37	C	902.9	25.0%	D
32	ELLISVILLE HARBOR	2188	2020	167	381.3	18.9%	A	221	1.31	A	198.3	9.8%	A
33	GREAT HERRING POND / BOURNEDALE	3498	2885	613	805.0	27.9%	A	384	1.60	A	329.6	11.4%	B
34	SANDWICH HARBOR	7124	7008	116	1266.4	18.1%	A	1225	2.10	C	629.3	9.0%	B
35	SCORTON CREEK	6383	6169	214	1537.9	24.9%	C	831	1.62	B	565.1	9.2%	B
36	BARNSTABLE HARBOR	20142	18206	1936	3665.9	20.1%	B	3609	2.38	C	1426.8	7.8%	A
37	CHASE GARDEN CREEK	4801	4634	167	1790.3	38.6%	D	912	2.36	C	654.8	14.1%	D
38	SESUIT CREEK / SESUIT HARBOR	1695	1586	109	762.0	48.0%	D	224	1.70	B	288.3	18.2%	D
39	QUIVETT CREEK	1470	1447	23	355.1	24.5%	B	166	1.38	A	146.1	10.1%	C
40	PAINE'S CREEK / STONY BROOK	3702	3301	401	821.7	24.9%	C	388	1.41	B	334.7	10.1%	C
41	NAMSKAKET CREEK / LITTLE NAMSKAKET CREEK	2976	2669	307	716.1	26.8%	C	542	2.44	D	327.7	12.3%	C
42	BOAT MEADOW CREEK / ROCK HARBOR	1315	1279	37	453.9	35.5%	C	354	3.32	D	172.8	13.5%	D
43	HERRING RIVER / HERRING POND	706	652	54	140.7	21.6%	B	101	1.85	B	46.9	7.2%	A
44	HERRING BROOK / GREAT POND	884	677	207	294.3	43.5%	D	67	1.19	A	96.7	14.3%	D
45	WELLFLEET HARBOR	17235	12323	4912	1916.6	15.6%	A	1157	1.13	A	935.7	7.6%	A
46	PAMET RIVER / LITTLE PAMET RIVER	3453	3399	53	483.6	14.2%	A	235	0.83	A	295.9	8.7%	B
47	PROVINCETOWN HARBOR	7821	3633	4188	664.2	18.3%	A	851	2.81	D	458.8	12.6%	C

TABLE OF INDICATOR STATISTICS:
STRESSORS (REGIONAL ANALYSIS)

					Population			**Wastewater Discharge to Surface Water**			**Wastewater Discharge to Groundwater**		
ID	ESTUARINE WATERSHE NAME	Total Watershed Area	Area of Land (acres)	Area of Open Water (acres)	Estimated Population	Estimated Population Density (persons/ac)	Population Ranking	Number of Wastewater Treatment Plants discharging to surface water	Wastewater Treatment Plant Permitted Flow Rate (MGD)	Wastewater to Surface Water Ranking	Facilities discharging wastewater to groundwater (>10,000 gal/day)	Flowrate from facilities discharging wastewater to groundwater (MGD)	Wastewater to Groundwater Ranking
1	MERRIMACK RIVER / BLACK ROCK CREEK	12940	11199	1741	18725	1.67	C	3	6.6	D	0	0.000	A
2	PARKER RIVER	7660	7198	462	2475	0.34	A	0	0.0	A	1	0.015	D
3	ROWLEY RIVER	3185	2936	249	815	0.28	A	0	0.0	A	0	0.000	A
4	IPSWICH RIVER	6024	5637	387	7091	1.26	C	0	0.0	A	0	0.000	A
5	PLUM ISLAND SOUND	29000	24063	4937	12048	0.50	B	1	1.8	C	1	0.015	D
6	ESSEX RIVER / ESSEX BAY	12369	10984	1385	3793	0.35	B	0	0.0	A	0	0.000	A
7	ANNISQUAM RIVER	5649	4883	766	9064	1.86	C	0	0.0	A	0	0.000	A
8	ROCKPORT HARBOR (SANDY BAY)	2477	1554	923	4634	2.98	D	1	0.8	B	0	0.000	A
9	GLOUCESTER HARBOR	3115	1602	1513	9552	5.96	D	1	7.2	D	0	0.000	A
10	MANCHESTER HARBOR	4296	3967	329	4147	1.05	A	1	1.2	D	0	0.000	A
11	DANVERS RIVER	18346	17740	606	91225	5.14	B	0	0.0	A	0	0.000	A
12	BEVERLY HARBOR	20573	19379	1194	103156	5.32	C	0	0.0	A	0	0.000	A
13	FOREST RIVER / SALEM HARBOR	4798	3655	1143	27409	7.50	C	0	0.0	A	0	0.000	A
14	MARBLEHEAD HARBOR	1143	785	359	7359	9.38	D	0	0.0	A	0	0.000	A
15	SALEM SOUND	40124	32009	8114	149810	4.68	B	1	1.2	D	0	0.000	A
16	SAUGUS RIVER / PINES RIVER / LYNN HARBOR	17132	10864	6269	129179	11.89	C	1	25.8	D	0	0.000	A
17	BELLE ISLE CREEK / WINTHROP BAY	3644	3062	582	24090	7.87	B	0	0.0	A	0	0.000	A
18	CHELSEA CREEK / MYSTIC RIVER / CHARLES RIVER	16388	13862	2526	261269	18.85	D	0	0.0	A	0	0.000	A
19	NEPONSET RIVER / DORCHESTER BAY	11823	9665	2157	179633	18.59	D	0	0.0	A	0	0.000	A
20	BLACKS CREEK / QUINCY BAY	5331	1825	3506	16979	9.31	B	0	0.0	A	0	0.000	A
21	BACK RIVER / FORE RIVER / HINGHAM BAY	17864	10207	7657	59852	5.86	A	0	0.0	A	0	0.000	A
22	WEIR RIVER / STRAITS POND	3451	2816	635	5113	1.82	A	0	0.0	A	1	0.007	D
23	BOSTON HARBOR	67679	42415	25264	548641	12.94	C	0	0.0	A	1	0.007	D
24	LITTLE HARBOR	979	838	142	1376	1.64	C	0	0.0	A	0	0.000	A
25	COHASSET HARBOR	4811	4291	520	7018	1.64	C	1	0.1	B	0	0.000	A
26	SCITUATE HARBOR	1764	1616	148	4264	2.64	D	0	0.0	A	0	0.000	A
27	NORTH RIVER / SOUTH RIVER	13590	12859	730	13350	1.04	B	1	1.6	C	1	0.013	B
28	GREEN HARBOR	3071	2795	276	6306	2.26	D	0	0.0	A	0	0.000	A
29	BLUEFISH RIVER / BACK RIVER / DUXBURY BAY	10398	5000	5398	4669	0.93	A	0	0.0	A	1	0.031	B
30	JONES RIVER / KINGSTON BAY	7861	4923	2938	10067	2.04	C	0	0.0	A	1	0.907	D
31	EEL RIVER / PLYMOUTH HARBOR	5290	3617	1673	10377	2.87	D	1	1.8	C	0	0.000	A
32	ELLISVILLE HARBOR	2188	2020	167	1255	0.62	A	0	0.0	A	0	0.000	A
33	GREAT HERRING POND / BOURNEDALE	3498	2885	613	2904	1.01	B	0	0.0	A	1	0.080	C
34	SANDWICH HARBOR	7124	7008	116	3586	0.51	B	0	0.0	A	0	0.000	A
35	SCORTON CREEK	6383	6169	214	5531	0.90	C	0	0.0	A	2	0.035	C
36	BARNSTABLE HARBOR	20142	18206	1936	8333	0.46	A	0	0.0	A	0	0.000	A
37	CHASE GARDEN CREEK	4801	4634	167	5700	1.23	D	0	0.0	A	1	0.165	D
38	SESUIT CREEK / SESUIT HARBOR	1695	1586	109	1630	1.03	D	0	0.0	A	0	0.000	A
39	QUIVETT CREEK	1470	1447	23	968	0.67	B	0	0.0	A	0	0.000	A
40	PAINE'S CREEK / STONY BROOK	3702	3301	401	2445	0.74	C	0	0.0	A	1	0.032	B
41	NAMSKAKET CREEK / LITTLE NAMSKAKET CREEK	2976	2669	307	1697	0.64	B	0	0.0	A	4	0.135	C
42	BOAT MEADOW CREEK / ROCK HARBOR	1315	1279	37	1249	0.98	D	0	0.0	A	0	0.000	A
43	HERRING RIVER / HERRING POND	706	652	54	292	0.45	A	0	0.0	A	0	0.000	A
44	HERRING BROOK / GREAT POND	884	677	207	546	0.81	C	0	0.0	A	1	0.029	B
45	WELLFLEET HARBOR	17235	12323	4912	3172	0.26	A	0	0.0	A	1	0.022	B
46	PAMET RIVER / LITTLE PAMET RIVER	3453	3399	53	679	0.20	A	0	0.0	A	0	0.000	A
47	PROVINCETOWN HARBOR	7821	3633	4188	2926	0.81	C	0	0.0	A	1	0.575	D

TABLE OF INDICATOR STATISTICS:
STRESSORS (REGIONAL ANALYSIS)

					Septic System Use				Designated Shellfish Growing Area Status								
ID	ESTUARINE WATERSHE NAME	Total Watershed Area	Area of Land (acres)	Area of Open Water (acres)	Estimated Population using septic systems	Percentage of population using septic systems	Estimated flowrate from septic systems (MGD)	Septic System Ranking	Conditionally Approved (acres)	Prohibited (acres)	Approved (acres)	Conditionally Restricted (acres)	Management Close (acres)	Restricted (acres)	TOTAL (acres)	Percentage Conditionally Approved or Approved	DSGA Ranking
1	MERRIMACK RIVER / BLACK ROCK CREEK	12940	11199	1741	3305	18%	0.229	C	0	1647	22	970	0	0	2640	0.84%	C
2	PARKER RIVER	7660	7198	462	1384	56%	0.096	A	155	277	0	0	0	0	432	35.93%	C
3	ROWLEY RIVER	3185	2936	249	702	86%	0.049	A	244	0	0	0	0	0	244	100.00%	D
4	IPSWICH RIVER	6024	5637	387	3523	50%	0.244	C	284	124	1	0	0	0	409	69.65%	B
5	PLUM ISLAND SOUND	29000	24063	4937	6440	53%	0.446	D	3663	401	964	52	0	0	5079	91.09%	A
6	ESSEX RIVER / ESSEX BAY	12369	10984	1385	1877	49%	0.130	B	1878	107	70	0	0	30	2084	93.44%	A
7	ANNISQUAM RIVER	5649	4883	766	4387	48%	0.304	D	816	170	142	0	0	0	1127	84.94%	B
8	ROCKPORT HARBOR (SANDY BAY)	2477	1554	923	2304	50%	0.160	B	0	915	0	0	0	0	915	0.00%	D
9	GLOUCESTER HARBOR	3115	1602	1513	4736	50%	0.328	D	0	1533	0	0	0	0	1533	0.00%	D
10	MANCHESTER HARBOR	4296	3967	329	68	2%	0.005	D	0	330	0	0	0	0	330	0.00%	D
11	DANVERS RIVER	18346	17740	606	0	0%	0.000	A	0	697	0	0	0	0	697	0.00%	D
12	BEVERLY HARBOR	20573	19379	1194	0	0%	0.000	A	0	1344	0	0	0	0	1344	0.00%	D
13	FOREST RIVER / SALEM HARBOR	4798	3655	1143	0	0%	0.000	A	0	1133	0	0	0	0	1133	0.00%	D
14	MARBLEHEAD HARBOR	1143	785	359	0	0%	0.000	A	0	362	0	0	0	0	362	0.00%	D
15	SALEM SOUND	40124	32009	8114	68	0%	0.005	D	0	8305	0	0	0	0	8305	0.00%	D
16	SAUGUS RIVER / PINES RIVER / LYNN HARBOR	17132	10864	6269	0	0%	0.000	A	0	6629	0	222	0	0	6851	0.00%	D
17	BELLE ISLE CREEK / WINTHROP BAY	3644	3062	582	0	0%	0.000	A	0	712	0	403	0	0	1115	0.00%	D
18	CHELSEA CREEK / MYSTIC RIVER / CHARLES RIVER	16388	13862	2526	0	0%	0.000	A	0	2606	0	128	0	0	2734	0.00%	D
19	NEPONSET RIVER / DORCHESTER BAY	11823	9665	2157	0	0%	0.000	A	0	2373	0	149	0	0	2522	0.00%	D
20	BLACKS CREEK / QUINCY BAY	5331	1825	3506	0	0%	0.000	A	0	2892	0	950	0	0	3841	0.00%	D
21	BACK RIVER / FORE RIVER / HINGHAM BAY	17864	10207	7657	0	0%	0.000	A	0	7378	0	1166	4	0	8548	0.00%	D
22	WEIR RIVER / STRAITS POND	3451	2816	635	532	10%	0.037	D	0	350	0	257	0	0	607	0.00%	D
23	BOSTON HARBOR	67679	42415	25264	532	0%	0.037	D	0	8090	0	245	1	0	8336	0.00%	D
24	LITTLE HARBOR	979	838	142	670	49%	0.046	A	0	188	0	0	0	0	188	0.00%	D
25	COHASSET HARBOR	4811	4291	520	3489	50%	0.242	C	0	261	487	0	0	0	748	65.09%	B
26	SCITUATE HARBOR	1764	1616	148	2088	49%	0.145	B	0	193	7	0	0	0	201	3.64%	C
27	NORTH RIVER / SOUTH RIVER	13590	12859	730	7367	55%	0.511	D	243	681	39	0	0	0	963	29.26%	C
28	GREEN HARBOR	3071	2795	276	3154	50%	0.219	C	0	59	123	0	0	0	182	67.77%	B
29	BLUEFISH RIVER / BACK RIVER / DUXBURY BAY	10398	5000	5398	3902	84%	0.270	C	107	19	5601	0	0	0	5727	99.67%	A
30	JONES RIVER / KINGSTON BAY	7861	4923	2938	6140	61%	0.426	D	845	514	1552	0	0	0	2912	82.33%	B
31	EEL RIVER / PLYMOUTH HARBOR	5290	3617	1673	5185	50%	0.359	D	0	1663	0	0	0	0	1663	0.00%	D
32	ELLISVILLE HARBOR	2188	2020	167	627	50%	0.043	A	0	8	80	0	0	0	88	90.92%	A
33	GREAT HERRING POND / BOURNEDALE	3498	2885	613	1656	57%	0.115	B	0		0	0	0	0	0	NA	A
34	SANDWICH HARBOR	7124	7008	116	3584	100%	0.248	C	43	33	11	0	0	0	88	62.34%	C
35	SCORTON CREEK	6383	6169	214	5530	100%	0.383	D	0	32	7	0	0	0	39	18.57%	C
36	BARNSTABLE HARBOR	20142	18206	1936	4862	58%	0.337	D	601	116	2091	0	0	0	2809	95.86%	B
37	CHASE GARDEN CREEK	4801	4634	167	5696	100%	0.395	D	65	55	7	0	0	0	126	56.52%	C
38	SESUIT CREEK / SESUIT HARBOR	1695	1586	109	1630	100%	0.113	B	41	0	4	0	0	0	45	100.00%	A
39	QUIVETT CREEK	1470	1447	23	967	100%	0.067	B	0	12	0	0	0	0	12	0.00%	D
40	PAINE'S CREEK / STONY BROOK	3702	3301	401	2445	100%	0.169	C	0	1	0	0	0	0	1	0.00%	D
41	NAMSKAKET CREEK / LITTLE NAMSKAKET CREEK	2976	2669	307	1333	79%	0.092	B	0	11	0	0	0	0	11	0.00%	D
42	BOAT MEADOW CREEK / ROCK HARBOR	1315	1279	37	845	68%	0.059	A	0	31	0	0	0	0	31	0.48%	D
43	HERRING RIVER / HERRING POND	706	652	54	288	99%	0.020	A	0	29	7	0	0	0	36	19.42%	C
44	HERRING BROOK / GREAT POND	884	677	207	546	100%	0.038	A	0	0	0	0	0	0	0	100.00%	A
45	WELLFLEET HARBOR	17235	12323	4912	3157	100%	0.219	C	194	86	5817	0	0	0	6096	98.58%	A
46	PAMET RIVER / LITTLE PAMET RIVER	3453	3399	53	678	100%	0.047	A	34	16	0	0	0	0	51	67.50%	C
47	PROVINCETOWN HARBOR	7821	3633	4188	1483	51%	0.103	B	485	595	3278	0	0	0	4357	86.35%	B

TABLE OF INDICATOR STATISTICS:
STRESSORS (REGIONAL ANALYSIS)

					303(d) listed impairments (waterbodies)							303(d) listed impairments (streams)						
ID	ESTUARINE WATERSHE NAME	Total Watershed Area	Area of Land (acres)	Area of Open Water (acres)	Nutrient Listing (acres)	Bacteria Listing (acres)	Total Assessed Area (ac)	Nutrient Listing (%)	Nutrient Ranking - Waterbodies	Bacteria Listing (%)	Bacteria Ranking - Waterbodies	Nutrient Listing (miles)	Bacteria Listing (miles)	Total Assessed Length (miles)	Nutrient Listing (%)	Nutrient Ranking - Streams	Bacteria Listing (%)	Bacteria Ranking - Streams
1	MERRIMACK RIVER / BLACK ROCK CREEK	12940	11199	1741	0.0	2669.7	2670	0.0%	A	100.0%	D	0.00	0.00	0.00	NA	A	NA	A
2	PARKER RIVER	7660	7198	462	0.0	491.7	494	0.0%	A	99.5%	C	0.00	0.00	0.00	0.0%	A	0.0%	A
3	ROWLEY RIVER	3185	2936	249	0.0	186.7	187	0.0%	A	100.0%	D	0.00	0.00	0.90	0.0%	A	0.0%	A
4	IPSWICH RIVER	6024	5637	387	0.0	301.2	301	0.0%	A	100.0%	D	0.00	3.71	6.24	0.0%		59.5%	B
5	PLUM ISLAND SOUND	29000	24063	4937	0.0	4386.4	4388	0.0%	A	100.0%	D	0.00	3.71	7.15	0.0%	A	51.9%	B
6	ESSEX RIVER / ESSEX BAY	12369	10984	1385	0.0	947.3	947	0.0%	A	100.0%	D	0.00	0.37	0.37	0.0%	A	100.0%	D
7	ANNISQUAM RIVER	5649	4883	766	3.3	587.4	619	0.5%	D	94.9%	B	0.00	0.00	0.38	0.0%	A	0.0%	A
8	ROCKPORT HARBOR (SANDY BAY)	2477	1554	923	0.0	15.7	23	0.0%	A	67.8%	A	0.00	0.00	0.00	NA	A	NA	A
9	GLOUCESTER HARBOR	3115	1602	1513	0.0	1486.2	1491	0.0%	A	99.7%	C	0.00	0.00	0.00	NA	A	NA	A
10	MANCHESTER HARBOR	4296	3967	329	0.0	306.9	307	0.0%	A	100.0%	D	0.00	2.76	2.76	0.0%	A	100.0%	D
11	DANVERS RIVER	18346	17740	606	92.8	701.4	736	12.6%	D	95.4%	A	6.24	9.08	14.20	43.9%	D	63.9%	B
12	BEVERLY HARBOR	20573	19379	1194	92.8	1347.8	1382	6.7%	C	97.5%	B	6.24	9.08	14.20	43.9%	D	63.9%	B
13	FOREST RIVER / SALEM HARBOR	4798	3655	1143	0.0	1099.0	1115	0.0%	A	98.5%	B	0.00	0.00	0.00	NA	A	NA	A
14	MARBLEHEAD HARBOR	1143	785	359	0.0	359.4	359	0.0%	A	100.0%	D	0.00	0.00	0.00	NA	A	NA	A
15	SALEM SOUND	40124	32009	8114	92.8	8169.0	8220	1.1%	B	99.4%	C	6.24	11.83	16.96	36.8%	C	69.8%	C
16	SAUGUS RIVER / PINES RIVER / LYNN HARBOR	17132	10864	6269	0.0	5870.7	5871	0.0%	A	100.0%	D	0.00	0.30	0.30	0.0%	A	100.0%	D
17	BELLE ISLE CREEK / WINTHROP BAY	3644	3062	582	0.0	1072.9	1152	0.0%	A	93.2%	A	0.00	0.00	0.00	NA	A	NA	A
18	CHELSEA CREEK / MYSTIC RIVER / CHARLES RIVER	16388	13862	2526	565.9	2499.8	2503	22.6%	D	99.9%	B	2.71	5.22	5.25	51.6%	B	99.4%	C
19	NEPONSET RIVER / DORCHESTER BAY	11823	9665	2157	0.0	2651.6	2652	0.0%	A	100.0%	D	1.65	2.28	2.28	72.6%	D	100.0%	D
20	BLACKS CREEK / QUINCY BAY	5331	1825	3506	0.0	3803.6	3804	0.0%	A	100.0%	D	0.00	0.00	0.25	0.0%	A	0.0%	A
21	BACK RIVER / FORE RIVER / HINGHAM BAY	17864	10207	7657	0.0	8823.0	8823	0.0%	A	100.0%	D	0.00	1.65	1.65	0.0%	A	100.0%	D
22	WEIR RIVER / STRAITS POND	3451	2816	635	0.0	529.3	529	0.0%	A	100.0%	D	0.00	0.76	0.76	0.0%	A	100.0%	D
23	BOSTON HARBOR	67679	42415	25264	565.9	27755.1	27838	2.0%	B	99.7%	B	4.36	9.91	10.19	42.8%	C	97.2%	B
24	LITTLE HARBOR	979	838	142	0.0	153.9	154	0.0%	A	100.0%	D	0.00	0.00	0.00	NA	A	NA	A
25	COHASSET HARBOR	4811	4291	520	69.8	651.0	651	10.7%	B	100.0%	D	0.00	0.00	0.35	0.0%	A	0.0%	A
26	SCITUATE HARBOR	1764	1616	148	0.0	206.2	206	0.0%	A	100.0%	D	0.00	0.00	0.00	NA	A	NA	A
27	NORTH RIVER / SOUTH RIVER	13590	12859	730	0.0	920.8	921	0.0%	A	100.0%	D	0.00	0.00	0.99	0.0%	A	0.0%	A
28	GREEN HARBOR	3071	2795	276	0.0	50.2	57	0.0%	A	88.6%	C	4.61	0.00	4.61	100.0%	D	0.0%	A
29	BLUEFISH RIVER / BACK RIVER / DUXBURY BAY	10398	5000	5398	0.0	5298.3	5321	0.0%	A	99.6%	C	0.00	0.00	0.00	NA	A	NA	A
30	JONES RIVER / KINGSTON BAY	7861	4923	2938	0.0	2912.6	2920	0.0%	A	99.8%	C	0.98	0.00	0.98	100.0%	D	0.0%	A
31	EEL RIVER / PLYMOUTH HARBOR	5290	3617	1673	1619.8	1634.7	1635	99.1%	D	100.0%	D	0.00	0.00	2.24	0.0%	A	0.0%	A
32	ELLISVILLE HARBOR	2188	2020	167	0.0	7.5	72	0.0%	A	10.4%	B	0.00	0.00	0.00	NA	A	NA	A
33	GREAT HERRING POND / BOURNEDALE	3498	2885	613	0.0	0.0	583	0.0%	A	0.0%	A	0.00	0.00	0.00	NA	A	NA	A
34	SANDWICH HARBOR	7124	7008	116	45.3	0.0	124	36.5%	B	0.0%	A	0.00	0.00	0.00	NA	A	NA	A
35	SCORTON CREEK	6383	6169	214	0.0	42.2	114	0.0%	A	36.9%	B	0.00	0.10	0.10	0.0%	A	100.0%	D
36	BARNSTABLE HARBOR	20142	18206	1936	0.0	2156.9	2168	0.0%	A	99.5%	C	0.00	1.09	1.09	0.0%	A	100.0%	D
37	CHASE GARDEN CREEK	4801	4634	167	0.0	97.6	104	0.0%	A	93.9%	C	0.00	2.01	2.01	0.0%	A	100.0%	D
38	SESUIT CREEK / SESUIT HARBOR	1695	1586	109	0.0	8.0	63	0.0%	A	12.8%	B	0.00	0.00	0.00	NA	A	NA	A
39	QUIVETT CREEK	1470	1447	23	0.0	15.3	15	0.0%	A	100.0%	D	0.00	1.71	1.71	0.0%	A	100.0%	D
40	PAINE'S CREEK / STONY BROOK	3702	3301	401	293.0	0.0	294	99.6%	D	0.0%	A	0.00	0.00	0.00	NA	A	NA	A
41	NAMSKAKET CREEK / LITTLE NAMSKAKET CREEK	2976	2669	307	0.0	16.8	209	0.0%	A	8.1%	B	0.00	1.01	1.01	0.0%	A	100.0%	D
42	BOAT MEADOW CREEK / ROCK HARBOR	1315	1279	37	0.0	40.4	40	0.0%	A	100.0%	D	0.00	1.67	1.67	0.0%	A	100.0%	D
43	HERRING RIVER / HERRING POND	706	652	54	0.0	0.0	42	0.0%	A	0.0%	A	0.00	0.00	0.00	NA	A	NA	A
44	HERRING BROOK / GREAT POND	884	677	207	109.4	0.0	135	81.2%	C	0.0%	A	0.00	0.00	0.00	NA	A	NA	A
45	WELLFLEET HARBOR	17235	12323	4912	0.2	5758.9	5785	0.0%	A	99.6%	C	0.00	0.03	3.63	0.0%	A	0.9%	B
46	PAMET RIVER / LITTLE PAMET RIVER	3453	3399	53	0.0	89.2	89	0.0%	A	100.0%	D	0.00	0.00	0.00	NA	A	NA	A
47	PROVINCETOWN HARBOR	7821	3633	4188	0.0	2774.1	3132	0.0%	A	88.6%	C	0.00	0.00	0.00	NA	A	NA	A

TABLE OF INDICATOR STATISTICS:
STRESSORS (REGIONAL ANALYSIS)

					Crossings/Impoundments							
ID	ESTUARINE WATERSHE NAME	Total Watershed Area	Area of Land (acres)	Area of Open Water (acres)	Number of Impoundments without fish passage structure	Impoundments Ranking	Number of Road Crossings	Number of Road Crossings per square mile	Crossings Ranking	Number of Road Crossings in Tidal Areas	Number of Road Crossings in Tidal Areas per square mile	Tidal Crossings Ranking
1	MERRIMACK RIVER / BLACK ROCK CREEK	12940	11199	1741	2	B	47	2.7	C	25	1.42	B
2	PARKER RIVER	7660	7198	462	4	C	46	4.1	D	24	2.11	C
3	ROWLEY RIVER	3185	2936	249	1	A	13	2.8	C	11	2.38	D
4	IPSWICH RIVER	6024	5637	387	2	B	28	3.1	D	10	1.12	B
5	PLUM ISLAND SOUND	29000	24063	4937	7	D	99	2.6	B	54	1.42	B
6	ESSEX RIVER / ESSEX BAY	12369	10984	1385	2	B	44	2.5	B	25	1.44	C
7	ANNISQUAM RIVER	5649	4883	766	13	D	33	4.3	D	21	2.73	D
8	ROCKPORT HARBOR (SANDY BAY)	2477	1554	923	2	B	4	1.6	A	2	0.82	A
9	GLOUCESTER HARBOR	3115	1602	1513	3	C	5	2.0	A	1	0.40	A
10	MANCHESTER HARBOR	4296	3967	329	4	B	51	8.2	D	17	2.72	D
11	DANVERS RIVER	18346	17740	606	18	C	179	6.4	B	33	1.18	B
12	BEVERLY HARBOR	20573	19379	1194	19	C	213	7.0	D	33	1.08	B
13	FOREST RIVER / SALEM HARBOR	4798	3655	1143	0	A	32	5.6	C	11	1.91	C
14	MARBLEHEAD HARBOR	1143	785	359	0	A	0	0.0	A	0	0.00	A
15	SALEM SOUND	40124	32009	8114	23	D	348	6.9	B	79	1.56	C
16	SAUGUS RIVER / PINES RIVER / LYNN HARBOR	17132	10864	6269	5	C	34	2.0	C	31	1.81	C
17	BELLE ISLE CREEK / WINTHROP BAY	3644	3062	582	0	A	3	0.6	A	3	0.62	B
18	CHELSEA CREEK / MYSTIC RIVER / CHARLES RIVER	16388	13862	2526	12	D	19	0.9	B	7	0.32	A
19	NEPONSET RIVER / DORCHESTER BAY	11823	9665	2157	1	B	9	0.6	A	3	0.20	A
20	BLACKS CREEK / QUINCY BAY	5331	1825	3506	0	A	13	4.5	D	13	4.52	D
21	BACK RIVER / FORE RIVER / HINGHAM BAY	17864	10207	7657	0	A	28	1.7	C	25	1.55	C
22	WEIR RIVER / STRAITS POND	3451	2816	635	2	B	19	4.3	D	8	1.80	C
23	BOSTON HARBOR	67679	42415	25264	15	D	91	1.4	B	59	0.88	B
24	LITTLE HARBOR	979	838	142	1	B	6	4.5	D	5	3.78	D
25	COHASSET HARBOR	4811	4291	520	0	A	21	3.1	C	15	2.22	D
26	SCITUATE HARBOR	1764	1616	148	0	A	10	3.9	D	6	2.35	D
27	NORTH RIVER / SOUTH RIVER	13590	12859	730	12	D	47	2.3	B	25	1.23	C
28	GREEN HARBOR	3071	2795	276	1	B	9	2.0	A	6	1.36	C
29	BLUEFISH RIVER / BACK RIVER / DUXBURY BAY	10398	5000	5398	2	C	18	2.3	B	8	1.01	B
30	JONES RIVER / KINGSTON BAY	7861	4923	2938	10	D	22	2.8	C	11	1.42	C
31	EEL RIVER / PLYMOUTH HARBOR	5290	3617	1673	4	C	18	3.2	C	5	0.88	A
32	ELLISVILLE HARBOR	2188	2020	167	0	A	3	0.9	A	3	0.94	B
33	GREAT HERRING POND / BOURNEDALE	3498	2885	613	0	A	11	2.4	B	0	0.00	A
34	SANDWICH HARBOR	7124	7008	116	4	D	16	1.4	C	10	0.90	B
35	SCORTON CREEK	6383	6169	214	2	C	12	1.2	B	9	0.93	C
36	BARNSTABLE HARBOR	20142	18206	1936	1	B	37	1.3	B	18	0.63	B
37	CHASE GARDEN CREEK	4801	4634	167	1	B	11	1.5	C	7	0.96	C
38	SESUIT CREEK / SESUIT HARBOR	1695	1586	109	0	A	10	4.0	D	9	3.60	D
39	QUIVETT CREEK	1470	1447	23	0	A	3	1.3	B	1	0.44	A
40	PAINE'S CREEK / STONY BROOK	3702	3301	401	0	A	11	2.1	D	10	1.92	D
41	NAMSKAKET CREEK / LITTLE NAMSKAKET CREEK	2976	2669	307	1	B	1	0.2	A	1	0.24	A
42	BOAT MEADOW CREEK / ROCK HARBOR	1315	1279	37	0	A	5	2.5	D	4	1.98	D
43	HERRING RIVER / HERRING POND	706	652	54	0	A	1	1.0	A	1	0.97	C
44	HERRING BROOK / GREAT POND	884	677	207	1	B	3	2.8	D	2	1.87	D
45	WELLFLEET HARBOR	17235	12323	4912	0	A	29	1.5	C	7	0.36	A
46	PAMET RIVER / LITTLE PAMET RIVER	3453	3399	53	0	A	11	2.1	D	3	0.56	B
47	PROVINCETOWN HARBOR	7821	3633	4188	1	B	2	0.3	A	0	0.00	A

TABLE OF INDICATOR STATISTICS:
RESOURCES (REGIONAL ANALYSIS)

Geosyntec Consultants, Inc.

					Salt Marsh Extent			Tidal Flat Extent			Seagrass Extent								
ID	ESTUARINE WATERSHE NAME	Total Watershed Area	Area of Land (acres)	Area of Open Water (acres)	Salt Marsh Extent (acres)	Salt Marsh Extent (% of Watershed Area)	Salt Marsh Extent Ranking	Tidal Flat Extent (acres)	Tidal Flat (% of Watershed Area)	Tidal Flat Extent Ranking	Seagrass Extent (1995) (acres)	Seagrass area per open water area (1995)	Seagrass Extent (2001) (acres)	Seagrass area per open water area (2001)	Seagrass Extent (2006) (acres)	Seagrass area per open water area (2006)	Average Seagrass Acreage	Average Seagrass Acreage per open water area	Seagrass Ranking
1	MERRIMACK RIVER / BLACK ROCK CREEK	12940	11199	1741	3557.7	27.49%	B	910.8	7.04%	A	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0%	D
2	PARKER RIVER	7660	7198	462	2218.6	28.96%	B	3.6	0.05%	C	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0%	D
3	ROWLEY RIVER	3185	2936	249	1345.3	42.24%	A	11.3	0.35%	C	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0%	D
4	IPSWICH RIVER	6024	5637	387	1307.8	21.71%	C	72.6	1.21%	B	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0%	D
5	PLUM ISLAND SOUND	29000	24063	4937	9721.4	33.52%	A	303.0	1.04%	B	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0%	D
6	ESSEX RIVER / ESSEX BAY	12369	10984	1385	3102.7	25.08%	B	725.9	5.87%	A	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0%	D
7	ANNISQUAM RIVER	5649	4883	766	639.3	11.32%	C	380.6	6.74%	A	17.1	0.0	11.4	0.0	14.3	0.0	14.2	1.9%	A
8	ROCKPORT HARBOR (SANDY BAY)	2477	1554	923	0.0	0.00%	D	0.0	0.00%	D	2.5	0.0	2.1	0.0	2.2	0.0	2.3	0.2%	C
9	GLOUCESTER HARBOR	3115	1602	1513	18.2	0.58%	D	1.1	0.03%	D	46.0	0.0	37.2	0.0	59.9	0.0	47.7	3.2%	B
10	MANCHESTER HARBOR	4296	3967	329	13.1	0.31%	D	7.1	0.17%	D	147.7	0.4	116.6	0.4	0.0	0.0	88.1	26.8%	A
11	DANVERS RIVER	18346	17740	606	95.6	0.52%	B	240.5	1.31%	A	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0%	D
12	BEVERLY HARBOR	20573	19379	1194	97.2	0.47%	C	297.8	1.45%	A	72.2	0.1	71.7	0.1	0.0	0.0	48.0	4.0%	C
13	FOREST RIVER / SALEM HARBOR	4798	3655	1143	35.6	0.74%	A	20.8	0.43%	C	103.5	0.1	18.9	0.0	31.1	0.0	51.2	4.5%	B
14	MARBLEHEAD HARBOR	1143	785	359	7.5	0.66%	A	1.2	0.11%	D	25.8	0.1	12.0	0.0	0.0	0.0	12.6	3.5%	C
15	SALEM SOUND	40124	32009	8114	198.0	0.49%	C	352.2	0.88%	B	690.5	0.1	528.1	0.1	35.9	0.0	418.2	5.2%	B
16	SAUGUS RIVER / PINES RIVER / LYNN HARBOR	17132	10864	6269	1011.9	5.91%	A	545.0	3.18%	B	751.3	0.1	667.1	0.1	694.4	0.1	704.3	11.2%	A
17	BELLE ISLE CREEK / WINTHROP BAY	3644	3062	582	366.9	10.07%	A	345.4	9.48%	A	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0%	D
18	CHELSEA CREEK / MYSTIC RIVER / CHARLES RIVER	16388	13862	2526	48.4	0.30%	D	207.3	1.27%	C	0.0	0.0	0.0	0.0	4.5	0.0	1.5	0.1%	C
19	NEPONSET RIVER / DORCHESTER BAY	11823	9665	2157	379.0	3.21%	B	337.3	2.85%	B	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0%	D
20	BLACKS CREEK / QUINCY BAY	5331	1825	3506	163.2	3.06%	C	104.2	1.96%	C	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0%	D
21	BACK RIVER / FORE RIVER / HINGHAM BAY	17864	10207	7657	522.0	2.92%	C	897.1	5.02%	A	180.7	0.0	39.0	0.0	63.8	0.0	94.5	1.2%	B
22	WEIR RIVER / STRAITS POND	3451	2816	635	143.7	4.16%	B	3.2	0.09%	D	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0%	D
23	BOSTON HARBOR	67679	42415	25264	1628.9	2.41%	D	1896.8	2.80%	B	201.5	0.0	66.6	0.0	116.2	0.0	128.1	0.5%	C
24	LITTLE HARBOR	979	838	142	58.4	5.97%	B	47.9	4.89%	A	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0%	D
25	COHASSET HARBOR	4811	4291	520	563.2	11.71%	A	234.6	4.88%	A	113.0	0.2	117.8	0.2	112.1	0.2	114.3	22.0%	A
26	SCITUATE HARBOR	1764	1616	148	103.1	5.84%	B	50.0	2.83%	B	12.0	0.1	10.3	0.1	10.5	0.1	10.9	7.4%	C
27	NORTH RIVER / SOUTH RIVER	13590	12859	730	2359.5	17.36%	A	351.8	2.59%	B	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0%	D
28	GREEN HARBOR	3071	2795	276	137.8	4.49%	B	0.0	0.00%	D	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0%	D
29	BLUEFISH RIVER / BACK RIVER / DUXBURY BAY	10398	5000	5398	1346.7	12.95%	A	389.9	3.75%	A	1443.9	0.3	1243.5	0.2	862.9	0.2	1183.4	21.9%	A
30	JONES RIVER / KINGSTON BAY	7861	4923	2938	233.9	2.98%	C	30.8	0.39%	C	348.4	0.1	312.7	0.1	546.5	0.2	402.5	13.7%	B
31	EEL RIVER / PLYMOUTH HARBOR	5290	3617	1673	31.4	0.59%	D	3.9	0.07%	C	319.7	0.2	252.6	0.2	326.7	0.2	299.7	17.9%	B
32	ELLISVILLE HARBOR	2188	2020	167	67.2	3.07%	C	0.0	0.00%	D	22.8	0.1	21.2	0.1	0.0	0.0	14.7	8.8%	C
33	GREAT HERRING POND / BOURNEDALE	3498	2885	613	0.0	0.00%	D	0.0	0.00%	D	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0%	D
34	SANDWICH HARBOR	7124	7008	116	570.5	8.01%	B	25.5	0.36%	C	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0%	D
35	SCORTON CREEK	6383	6169	214	403.9	6.33%	C	6.5	0.10%	D	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0%	D
36	BARNSTABLE HARBOR	20142	18206	1936	3905.0	19.39%	A	1106.4	5.49%	A	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0%	D
37	CHASE GARDEN CREEK	4801	4634	167	907.7	18.91%	A	46.0	0.96%	B	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0%	D
38	SESUIT CREEK / SESUIT HARBOR	1695	1586	109	61.5	3.63%	D	6.2	0.37%	C	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0%	D
39	QUIVETT CREEK	1470	1447	23	205.5	13.98%	B	12.3	0.83%	B	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0%	D
40	PAINE'S CREEK / STONY BROOK	3702	3301	401	57.1	1.54%	D	0.0	0.00%	D	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0%	D
41	NAMSKAKET CREEK / LITTLE NAMSKAKET CREEK	2976	2669	307	236.1	7.93%	B	10.8	0.36%	C	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0%	D
42	BOAT MEADOW CREEK / ROCK HARBOR	1315	1279	37	262.0	19.92%	A	11.4	0.86%	B	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0%	D
43	HERRING RIVER / HERRING POND	706	652	54	280.6	39.74%	A	29.1	4.12%	A	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0%	D
44	HERRING BROOK / GREAT POND	884	677	207	0.0	0.00%	D	0.0	0.01%	D	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0%	D
45	WELLFLEET HARBOR	17235	12323	4912	1236.0	7.17%	C	1199.8	6.96%	A	3.1	0.0	0.7	0.0	0.0	0.0	1.3	0.0%	D
46	PAMET RIVER / LITTLE PAMET RIVER	3453	3399	53	247.9	7.18%	C	14.2	0.41%	C	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0%	D
47	PROVINCETOWN HARBOR	7821	3633	4188	271.5	3.47%	D	254.7	3.26%	A	903.4	0.2	881.0	0.2	0.0	0.0	594.8	14.2%	A

TABLE OF INDICATOR STATISTICS:
RESOURCES (REGIONAL ANALYSIS)

					Shellfish Habitat (values in acres)													
ID	ESTUARINE WATERSHE NAME	Total Watershed Area	Area of Land (acres)	Area of Open Water (acres)	American Oyster	Bay Scallop	Blue Mussel	European Oyster	Ocean Quahog	Quahog	Razor Clam	Sea Scallop	Soft-shell clam	Surf Clam	Total Shellfish Habitat Area (acres)	Total Shellfish Habitat (species-acres)	Shellfish Habitat per Open Water Area	Shellfish Ranking
1	MERRIMACK RIVER / BLACK ROCK CREEK	12940	11199	1741	0	0	1333	0	0	0	682	0	1250	30	1438.213	3265	187.5%	A
2	PARKER RIVER	7660	7198	462	200	0	0	0	0	0	49	0	220	0	294.1086	468	101.4%	C
3	ROWLEY RIVER	3185	2936	249	1	0	3	0	0	0	196	0	209	0	210.208	410	164.5%	B
4	IPSWICH RIVER	6024	5637	387	1	0	31	0	0	0	27	0	309	0	308.58	367	94.9%	C
5	PLUM ISLAND SOUND	29000	24063	4937	311	0	348	24	0	10	1382	0	2591	702	3194.406	4666	94.5%	C
6	ESSEX RIVER / ESSEX BAY	12369	10984	1385	151	0	244	0	39	8	110	0	1414	193	1461.583	1966	142.0%	B
7	ANNISQUAM RIVER	5649	4883	766	10	0	403	79	132	38	134	0	654	175	902.2139	1451	189.3%	A
8	ROCKPORT HARBOR (SANDY BAY)	2477	1554	923	0	0	195	0	585	0	0	579	5	598	828.8935	1364	147.8%	B
9	GLOUCESTER HARBOR	3115	1602	1513	0	0	135	138	0	5	12	0	56	20	294.3834	346	22.9%	D
10	MANCHESTER HARBOR	4296	3967	329	4	0	68	6	0	15	0	0	31	0	98.63024	124	37.6%	B
11	DANVERS RIVER	18346	17740	606	0	0	70	3	0	29	0	0	340	0	386.9569	442	73.0%	A
12	BEVERLY HARBOR	20573	19379	1194	0	0	204	72	0	98	0	0	477	56	638.4482	852	71.3%	A
13	FOREST RIVER / SALEM HARBOR	4798	3655	1143	0	0	109	131	0	60	1	0	180	0	261.0942	482	42.2%	B
14	MARBLEHEAD HARBOR	1143	785	359	0	0	18	0	0	24	0	0	27	0	44.39786	68	19.0%	D
15	SALEM SOUND	40124	32009	8114	29	0	542	210	0	199	1	740	802	111	2053.756	2523	31.1%	C
16	SAUGUS RIVER / PINES RIVER / LYNN HARBOR	17132	10864	6269	0	0	771	0	0	0	57	0	635	25	1350.984	1463	23.3%	D
17	BELLE ISLE CREEK / WINTHROP BAY	3644	3062	582	0	0	126	0	0	0	0	0	533	0	538.8697	659	113.2%	A
18	CHELSEA CREEK / MYSTIC RIVER / CHARLES RIVER	16388	13862	2526	0	0	84	0	0	0	11	0	212	0	212.4649	308	12.2%	D
19	NEPONSET RIVER / DORCHESTER BAY	11823	9665	2157	0	0	371	0	0	0	147	0	604	0	620.0818	1122	52.0%	B
20	BLACKS CREEK / QUINCY BAY	5331	1825	3506	0	0	527	473	0	64	309	0	643	0	660.2372	2016	57.5%	B
21	BACK RIVER / FORE RIVER / HINGHAM BAY	17864	10207	7657	0	0	1337	303	0	0	252	0	1985	2	2340.081	3877	50.6%	C
22	WEIR RIVER / STRAITS POND	3451	2816	635	0	0	384	0	0	0	0	0	349	0	383.68	733	115.4%	A
23	BOSTON HARBOR	67679	42415	25264	0	0	3094	784	0	64	755	231	4766	2	5438.876	9694	38.4%	C
24	LITTLE HARBOR	979	838	142	0	0	30	0	0	7	0	0	16	0	50.60373	53	37.4%	C
25	COHASSET HARBOR	4811	4291	520	0	0	122	0	0	1	6	0	70	15	201.3611	198	38.1%	C
26	SCITUATE HARBOR	1764	1616	148	0	0	29	0	0	0	0	0	0	0	29.42449	29	19.9%	D
27	NORTH RIVER / SOUTH RIVER	13590	12859	730	12	0	330	0	0	69	116	0	201	0	462.4285	729	99.8%	B
28	GREEN HARBOR	3071	2795	276	0	0	52	0	0	1	5	0	31	118	169.8604	88	32.1%	C
29	BLUEFISH RIVER / BACK RIVER / DUXBURY BAY	10398	5000	5398	73	129	2159	0	0	2208	816	142	1231	651	2890.899	6757	125.2%	A
30	JONES RIVER / KINGSTON BAY	7861	4923	2938	0	0	1646	15	0	1275	105	0	591	450	2202.936	3632	123.6%	A
31	EEL RIVER / PLYMOUTH HARBOR	5290	3617	1673	0	104	612	0	0	192	232	0	295	8	719.5728	1435	85.8%	B
32	ELLISVILLE HARBOR	2188	2020	167	0	0	0	0	0	0	0	0	7	40	46.45324	7	4.1%	D
33	GREAT HERRING POND / BOURNEDALE	3498	2885	613	0	0	0	0	0	0	0	0	0	0		0	0.0%	D
34	SANDWICH HARBOR	7124	7008	116	0	0	23	0	0	35	0	0	59	12	73.05969	117	100.7%	B
35	SCORTON CREEK	6383	6169	214	0	0	9	0	0	22	0	0	22	15	45.78647	54	25.0%	C
36	BARNSTABLE HARBOR	20142	18206	1936	7	119	163	0	0	752	181	0	1751	65	1973.345	2972	153.5%	B
37	CHASE GARDEN CREEK	4801	4634	167	0	0	5	0	0	6	0	0	0	35	35.59804	12	7.0%	D
38	SESUIT CREEK / SESUIT HARBOR	1695	1586	109	7	0	14	0	0	15	0	0	4	0	31.05756	39	36.1%	C
39	QUIVETT CREEK	1470	1447	23	15	0	15	0	0	15	0	0	0	0	15.42633	46	199.0%	A
40	PAINE'S CREEK / STONY BROOK	3702	3301	401	4	0	4	0	0	4	0	0	0	0	3.887384	12	2.9%	D
41	NAMSKAKET CREEK / LITTLE NAMSKAKET CREEK	2976	2669	307	0	0	0	0	0	2	0	0	21	0	20.5378	23	7.5%	D
42	BOAT MEADOW CREEK / ROCK HARBOR	1315	1279	37	45	0	0	0	0	45	0	0	45	0	44.69779	134	364.0%	A
43	HERRING RIVER / HERRING POND	706	652	54	38	0	0	0	0	38	2	0	38	0	39.49982	115	214.0%	A
44	HERRING BROOK / GREAT POND	884	677	207	0	0	0	0	0	0	0	0	0	0	0	0	0.0%	D
45	WELLFLEET HARBOR	17235	12323	4912	1692	3425	7	0	0	4789	28	0	427	325	5396.97	10368	211.1%	A
46	PAMET RIVER / LITTLE PAMET RIVER	3453	3399	53	6	0	1	0	0	30	0	0	22	0	48.96253	59	110.6%	B
47	PROVINCETOWN HARBOR	7821	3633	4188	17	22	17	0	0	677	0	0	126	2217	2966.495	860	20.5%	C

					Shorebird Habitat (values in acres)																Shorebird Habitat (values in acres)
ID	ESTUARINE WATERSHE NAME	Total Watershed Area	Area of Land (acres)	Area of Open Water (acres)	American bittern	American black duck	Arctic tern	Bald eagle	Black-bellied plover	Black-crowned night-heron	Brant	Canada goose	Common moorhen	Common tern	Diving ducks	Double-crested cormorant	Dunlin	Eiders	Great black-backed gull	Great egret	Harlequin duck
1	MERRIMACK RIVER / BLACK ROCK CREEK	12940	11199	1741	734	1625	0	1632	890	0	0	734	734	2798	0	0	890	0	0	0	0
2	PARKER RIVER	7660	7198	462	317	317	0	0	0	0	0	317	317	317	0	0	0	0	0	0	0
3	ROWLEY RIVER	3185	2936	249	891	891	0	0	0	0	0	891	891	891	0	0	0	0	0	0	0
4	IPSWICH RIVER	6024	5637	387	397	1346	0	0	0	0	0	397	397	1346	0	0	0	0	0	0	0
5	PLUM ISLAND SOUND	29000	24063	4937	6847	7796	0	0	0	0	0	6847	6847	7796	0	0	0	0	0	0	0
6	ESSEX RIVER / ESSEX BAY	12369	10984	1385	0	3108	0	0	0	0	0	0	0	3108	0	0	0	0	0	0	0
7	ANNISQUAM RIVER	5649	4883	766	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8	ROCKPORT HARBOR (SANDY BAY)	2477	1554	923	0	0	0	0	0	0	0	0	0	0	0	0	0	620	0	0	2
9	GLOUCESTER HARBOR	3115	1602	1513	0	0	0	0	0	0	0	0	0	0	0	0	0	61	0	0	0
10	MANCHESTER HARBOR	4296	3967	329	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	DANVERS RIVER	18346	17740	606	0	929	0	0	0	0	0	929	0	0	0	0	0	0	0	0	0
12	BEVERLY HARBOR	20573	19379	1194	0	1010	0	0	0	0	0	1010	0	0	0	0	0	0	0	0	0
13	FOREST RIVER / SALEM HARBOR	4798	3655	1143	0	0	0	0	0	0	0	0	0	0	848	0	0	0	0	0	0
14	MARBLEHEAD HARBOR	1143	785	359	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	SALEM SOUND	40124	32009	8114	0	1010	0	0	0	0	0	1010	0	0	848	0	0	0	0	0	0
16	SAUGUS RIVER / PINES RIVER / LYNN HARBOR	17132	10864	6269	0	127	0	0	0	0	0	0	0	142	0	0	0	1528	0	0	0
17	BELLE ISLE CREEK / WINTHROP BAY	3644	3062	582	0	0	0	0	0	0	0	0	0	25	0	0	0	0	0	0	0
18	CHELSEA CREEK / MYSTIC RIVER / CHARLES RIVER	16388	13862	2526	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19	NEPONSET RIVER / DORCHESTER BAY	11823	9665	2157	0	140	0	0	0	0	140	0	0	0	0	0	0	0	0	0	0
20	BLACKS CREEK / QUINCY BAY	5331	1825	3506	0	113	0	0	0	0	113	0	0	0	0	0	0	0	0	0	0
21	BACK RIVER / FORE RIVER / HINGHAM BAY	17864	10207	7657	0	0	0	0	0	4	0	0	0	13	0	4	0	183	4	4	0
22	WEIR RIVER / STRAITS POND	3451	2816	635	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23	BOSTON HARBOR	67679	42415	25264	0	252	0	0	0	4	252	0	0	37	0	4	0	405	4	4	0
24	LITTLE HARBOR	979	838	142	0	165	0	0	0	0	0	165	0	0	0	0	0	0	0	0	0
25	COHASSET HARBOR	4811	4291	520	0	0	0	0	0	0	0	0	0	0	0	0	0	76	0	0	0
26	SCITUATE HARBOR	1764	1616	148	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
27	NORTH RIVER / SOUTH RIVER	13590	12859	730	0	605	0	0	0	0	0	0	0	0	0	0	0	327	0	0	0
28	GREEN HARBOR	3071	2795	276	0	0	0	0	0	0	0	0	1197	0	0	0	0	0	0	0	0
29	BLUEFISH RIVER / BACK RIVER / DUXBURY BAY	10398	5000	5398	0	5444	0	0	0	0	5444	0	0	0	0	0	0	5444	0	0	0
30	JONES RIVER / KINGSTON BAY	7861	4923	2938	0	2863	0	0	0	0	2863	0	0	0	0	0	0	2863	0	0	0
31	EEL RIVER / PLYMOUTH HARBOR	5290	3617	1673	0	1633	7	0	0	0	1633	0	0	7	0	0	0	1633	0	0	0
32	ELLISVILLE HARBOR	2188	2020	167	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
33	GREAT HERRING POND / BOURNEDALE	3498	2885	613	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
34	SANDWICH HARBOR	7124	7008	116	0	0	0	0	0	0	0	0	0	406	0	0	0	0	0	0	0
35	SCORTON CREEK	6383	6169	214	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
36	BARNSTABLE HARBOR	20142	18206	1936	0	6907	0	0	0	0	0	6907	0	42	0	0	0	6907	0	0	0
37	CHASE GARDEN CREEK	4801	4634	167	0	1187	0	0	0	0	0	1187	0	63	0	0	0	1187	0	0	0
38	SESUIT CREEK / SESUIT HARBOR	1695	1586	109	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
39	QUIVETT CREEK	1470	1447	23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
40	PAINE'S CREEK / STONY BROOK	3702	3301	401	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
41	NAMSKAKET CREEK / LITTLE NAMSKAKET CREEK	2976	2669	307	0	0	0	0	0	0	22	22	0	0	0	0	0	0	0	0	0
42	BOAT MEADOW CREEK / ROCK HARBOR	1315	1279	37	0	0	0	0	0	0	46	46	0	0	0	0	0	0	0	0	0
43	HERRING RIVER / HERRING POND	706	652	54	0	0	0	0	0	0	52	52	0	0	0	0	0	0	0	0	0
44	HERRING BROOK / GREAT POND	884	677	207	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
45	WELLFLEET HARBOR	17235	12323	4912	0	2468	0	0	0	0	287	0	0	0	0	0	0	287	0	0	0
46	PAMET RIVER / LITTLE PAMET RIVER	3453	3399	53	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
47	PROVINCETOWN HARBOR	7821	3633	4188	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

TABLE OF INDICATOR STATISTICS:
RESOURCES (REGIONAL ANALYSIS)

					Shorebird Habitat (values in acres)													
ID	ESTUARINE WATERSHE NAME	Total Watershed Area	Area of Land (acres)	Area of Open Water (acres)	Herring gull	Hudsonian godwit	King rail	Least bittern	Least tern	Lesser yellowlegs	Little blue heron	Mallard	Pied-billed grebe	Piping plover	Red knot	Roseate tern	Scoters	Semipalmated sandpiper
1	MERRIMACK RIVER / BLACK ROCK CREEK	12940	11199	1741	0	55	1691	734	1	890	0	0	734	1	890	0	0	890
2	PARKER RIVER	7660	7198	462	0	0	317	317	0	0	0	0	317	0	0	0	0	0
3	ROWLEY RIVER	3185	2936	249	0	0	891	891	0	0	0	0	891	0	0	0	0	0
4	IPSWICH RIVER	6024	5637	387	0	0	397	397	30	0	0	0	397	30	0	0	0	0
5	PLUM ISLAND SOUND	29000	24063	4937	0	0	6847	6847	227	0	0	0	6847	227	0	0	0	0
6	ESSEX RIVER / ESSEX BAY	12369	10984	1385	0	0	0	0	28	0	0	0	0	28	0	0	0	0
7	ANNISQUAM RIVER	5649	4883	766	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8	ROCKPORT HARBOR (SANDY BAY)	2477	1554	923	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9	GLOUCESTER HARBOR	3115	1602	1513	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10	MANCHESTER HARBOR	4296	3967	329	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	DANVERS RIVER	18346	17740	606	0	0	0	0	0	0	0	929	0	0	0	0	0	0
12	BEVERLY HARBOR	20573	19379	1194	0	0	0	0	0	0	0	1010	0	0	0	0	0	0
13	FOREST RIVER / SALEM HARBOR	4798	3655	1143	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	MARBLEHEAD HARBOR	1143	785	359	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	SALEM SOUND	40124	32009	8114	0	0	0	0	0	0	0	1010	0	0	0	0	0	0
16	SAUGUS RIVER / PINES RIVER / LYNN HARBOR	17132	10864	6269	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17	BELLE ISLE CREEK / WINTHROP BAY	3644	3062	582	0	0	0	0	25	0	0	0	0	25	0	0	0	0
18	CHELSEA CREEK / MYSTIC RIVER / CHARLES RIVER	16388	13862	2526	0	0	0	0	6	0	0	0	0	0	0	0	0	0
19	NEPONSET RIVER / DORCHESTER BAY	11823	9665	2157	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20	BLACKS CREEK / QUINCY BAY	5331	1825	3506	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21	BACK RIVER / FORE RIVER / HINGHAM BAY	17864	10207	7657	4	0	0	0	0	0	4	0	0	0	0	0	0	0
22	WEIR RIVER / STRAITS POND	3451	2816	635	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23	BOSTON HARBOR	67679	42415	25264	4	0	0	0	50	0	4	0	0	25	0	0	0	0
24	LITTLE HARBOR	979	838	142	0	0	0	0	0	0	0	165	0	0	0	0	0	0
25	COHASSET HARBOR	4811	4291	520	0	0	0	0	0	0	0	0	0	0	0	0	76	0
26	SCITUATE HARBOR	1764	1616	148	0	0	0	0	0	0	0	0	0	0	0	0	0	0
27	NORTH RIVER / SOUTH RIVER	13590	12859	730	0	0	0	0	164	0	0	605	0	164	112	0	0	0
28	GREEN HARBOR	3071	2795	276	0	0	0	1197	0	0	0	0	0	0	0	0	0	0
29	BLUEFISH RIVER / BACK RIVER / DUXBURY BAY	10398	5000	5398	0	0	0	0	116	0	0	0	0	116	0	0	5444	0
30	JONES RIVER / KINGSTON BAY	7861	4923	2938	0	0	0	0	2	0	0	0	0	2	0	0	2863	0
31	EEL RIVER / PLYMOUTH HARBOR	5290	3617	1673	0	0	0	0	35	0	0	0	0	35	162	7	1633	0
32	ELLISVILLE HARBOR	2188	2020	167	0	0	0	0	4	0	0	0	0	4	0	0	0	0
33	GREAT HERRING POND / BOURNEDALE	3498	2885	613	0	0	0	0	0	0	0	0	0	0	0	0	0	0
34	SANDWICH HARBOR	7124	7008	116	0	0	0	0	30	0	0	0	0	30	0	0	0	0
35	SCORTON CREEK	6383	6169	214	0	0	0	0	43	0	0	0	0	43	0	0	0	0
36	BARNSTABLE HARBOR	20142	18206	1936	0	0	0	0	4929	0	0	0	0	6	0	0	0	0
37	CHASE GARDEN CREEK	4801	4634	167	0	0	0	0	8	0	0	0	0	8	0	21	0	0
38	SESUIT CREEK / SESUIT HARBOR	1695	1586	109	0	0	0	0	0	0	0	0	0	0	0	0	0	0
39	QUIVETT CREEK	1470	1447	23	0	0	0	0	0	0	0	0	0	0	0	0	0	0
40	PAINE'S CREEK / STONY BROOK	3702	3301	401	0	0	0	0	0	0	0	0	0	0	0	0	0	0
41	NAMSKAKET CREEK / LITTLE NAMSKAKET CREEK	2976	2669	307	0	0	0	0	0	0	0	0	0	0	0	0	0	0
42	BOAT MEADOW CREEK / ROCK HARBOR	1315	1279	37	0	0	0	0	0	0	0	0	0	0	0	0	0	0
43	HERRING RIVER / HERRING POND	706	652	54	0	0	0	0	0	0	0	0	0	0	0	0	0	0
44	HERRING BROOK / GREAT POND	884	677	207	0	0	0	0	0	0	0	0	0	0	0	0	0	0
45	WELLFLEET HARBOR	17235	12323	4912	0	0	0	0	25	0	0	0	0	25	0	0	0	0
46	PAMET RIVER / LITTLE PAMET RIVER	3453	3399	53	0	0	0	0	9	0	0	0	0	9	0	0	0	0
47	PROVINCETOWN HARBOR	7821	3633	4188	0	0	0	0	200	0	0	0	0	200	0	0	0	0

														Anadromous Fish Run Length						
ID	ESTUARINE WATERSHE NAME	Total Watershed Area	Area of Land (acres)	Area of Open Water (acres)	Shorebirds	Short-billed dowitcher	Snowy egret	Wading birds	Waterfowl	Total Shorebird Habitat (species-acres)	Total Shorebird Habitat per Watershed Area (species-acres)	Shorebird Habitat Ranking	Alewife	American Shad	Atlantic Sturgeon	Blueback Herring	Rainbow Smelt	Total Miles	Anadromous Fish Run Ranking
1	MERRIMACK RIVER / BLACK ROCK CREEK	12940	11199	1741	895	890	0	0	1632	19342	149.5%	B	64.00	0.00	28.60	0.00	12.60	105.20	A
2	PARKER RIVER	7660	7198	462	43	0	0	0	0	2575	33.6%	C	16.98	0.00	0.00	9.46	4.19	30.64	B
3	ROWLEY RIVER	3185	2936	249	41	0	0	0	0	7170	225.1%	A	6.33	0.00	0.00	0.00	6.60	12.93	B
4	IPSWICH RIVER	6024	5637	387	212	0	0	0	0	5343	88.7%	B	0.00	0.00	0.00	8.40	0.00	8.40	C
5	PLUM ISLAND SOUND	29000	24063	4937	1615	0	0	0	0	58743	202.6%	A	23.31	0.00	0.00	17.87	10.80	51.98	A
6	ESSEX RIVER / ESSEX BAY	12369	10984	1385	911	0	0	0	208	7391	59.8%	C	5.52	0.00	0.00	0.00	3.44	8.96	C
7	ANNISQUAM RIVER	5649	4883	766	0	0	0	0	0	0	0.0%	D	1.72	0.00	0.00	0.00	0.00	1.72	C
8	ROCKPORT HARBOR (SANDY BAY)	2477	1554	923	0	0	0	0	0	622	25.1%	C	0.00	0.00	0.00	0.00	0.00	0.00	D
9	GLOUCESTER HARBOR	3115	1602	1513	0	0	0	0	0	61	2.0%	D	0.00	0.00	0.00	0.00	0.00	0.00	D
10	MANCHESTER HARBOR	4296	3967	329	0	0	0	0	0	0	0.0%	D	0.00	0.00	0.00	0.00	0.59	0.59	C
11	DANVERS RIVER	18346	17740	606	0	0	0	0	0	2786	15.2%	B	3.58	0.00	0.00	0.00	1.48	5.06	B
12	BEVERLY HARBOR	20573	19379	1194	0	0	0	0	0	3030	14.7%	B	3.58	0.00	0.00	0.00	1.48	5.06	B
13	FOREST RIVER / SALEM HARBOR	4798	3655	1143	0	0	0	0	0	848	17.7%	A	0.00	0.00	0.00	0.00	0.00	0.00	D
14	MARBLEHEAD HARBOR	1143	785	359	0	0	0	0	0	0	0.0%	D	0.00	0.00	0.00	0.00	0.00	0.00	D
15	SALEM SOUND	40124	32009	8114	0	0	0	0	0	3878	9.7%	C	3.58	0.00	0.00	0.00	2.43	6.01	A
16	SAUGUS RIVER / PINES RIVER / LYNN HARBOR	17132	10864	6269	0	0	0	0	0	1798	10.5%	A	0.00	0.00	0.00	0.00	4.21	4.21	C
17	BELLE ISLE CREEK / WINTHROP BAY	3644	3062	582	0	0	0	0	0	74	2.0%	D	0.00	0.00	0.00	0.00	0.00	0.00	D
18	CHELSEA CREEK / MYSTIC RIVER / CHARLES RIVER	16388	13862	2526	0	0	0	0	0	6	0.0%	D	7.50	20.52	0.00	0.00	9.56	37.58	A
19	NEPONSET RIVER / DORCHESTER BAY	11823	9665	2157	0	0	0	0	0	279	2.4%	C	0.00	4.35	0.00	0.00	0.97	5.32	C
20	BLACKS CREEK / QUINCY BAY	5331	1825	3506	0	0	0	0	0	225	4.2%	B	0.00	0.00	0.00	0.00	1.24	1.24	D
21	BACK RIVER / FORE RIVER / HINGHAM BAY	17864	10207	7657	0	0	4	529	0	751	4.2%	B	5.23	0.00	0.00	0.00	11.72	16.95	B
22	WEIR RIVER / STRAITS POND	3451	2816	635	0	0	0	261	0	261	7.6%	A	4.20	0.00	0.00	0.00	1.75	5.95	B
23	BOSTON HARBOR	67679	42415	25264	0	0	4	790	0	1837	2.7%	C	16.93	24.88	0.00	0.00	25.23	67.04	A
24	LITTLE HARBOR	979	838	142	0	0	0	0	0	495	50.5%	B	0.00	0.00	0.00	0.00	0.00	0.00	D
25	COHASSET HARBOR	4811	4291	520	0	0	0	0	0	152	3.2%	C	4.27	0.00	0.00	0.00	0.39	4.66	C
26	SCITUATE HARBOR	1764	1616	148	0	0	0	0	0	0	0.0%	D	0.00	0.00	0.00	0.00	0.09	0.09	C
27	NORTH RIVER / SOUTH RIVER	13590	12859	730	112	0	0	0	0	2090	15.4%	C	23.60	0.00	0.00	0.00	13.71	37.31	A
28	GREEN HARBOR	3071	2795	276	0	0	0	0	0	2394	78.0%	B	0.00	0.00	0.00	0.00	0.00	0.00	D
29	BLUEFISH RIVER / BACK RIVER / DUXBURY BAY	10398	5000	5398	3176	0	0	0	0	25185	242.2%	A	1.30	0.00	0.00	0.00	0.00	1.30	C
30	JONES RIVER / KINGSTON BAY	7861	4923	2938	1996	0	0	0	0	13452	171.1%	A	7.11	3.06	0.00	0.00	1.40	11.57	A
31	EEL RIVER / PLYMOUTH HARBOR	5290	3617	1673	641	0	0	0	0	7427	140.4%	A	5.91	0.00	0.00	1.72	0.91	8.53	B
32	ELLISVILLE HARBOR	2188	2020	167	0	0	0	0	0	9	0.4%	D	0.00	0.00	0.00	0.00	0.00	0.00	D
33	GREAT HERRING POND / BOURNEDALE	3498	2885	613	0	0	0	0	0	0	0.0%	D	3.86	0.00	0.00	3.44	0.00	7.30	B
34	SANDWICH HARBOR	7124	7008	116	0	0	0	0	0	465	6.5%	B	2.36	1.41	0.00	0.00	0.00	3.76	B
35	SCORTON CREEK	6383	6169	214	0	0	0	0	0	87	1.4%	C	0.00	0.00	0.00	0.00	0.00	0.00	D
36	BARNSTABLE HARBOR	20142	18206	1936	0	0	0	0	0	25698	127.6%	A	2.50	0.00	0.00	0.00	0.00	2.50	B
37	CHASE GARDEN CREEK	4801	4634	167	0	0	0	0	0	3660	76.2%	A	0.00	0.00	0.00	0.00	0.00	0.00	D
38	SESUIT CREEK / SESUIT HARBOR	1695	1586	109	0	0	0	0	0	0	0.0%	D	2.85	0.00	0.00	0.00	0.00	2.85	B
39	QUIVETT CREEK	1470	1447	23	0	0	0	0	0	0	0.0%	D	2.53	0.00	0.00	0.00	0.00	2.53	B
40	PAINE'S CREEK / STONY BROOK	3702	3301	401	0	0	0	0	0	0	0.0%	D	3.87	0.00	0.00	1.56	0.00	5.42	A
41	NAMSKAKET CREEK / LITTLE NAMSKAKET CREEK	2976	2669	307	22	0	0	0	0	66	2.2%	C	0.00	0.00	0.00	0.00	0.00	0.00	D
42	BOAT MEADOW CREEK / ROCK HARBOR	1315	1279	37	46	0	0	0	0	137	10.4%	B	1.77	0.00	0.00	0.00	0.00	1.77	C
43	HERRING RIVER / HERRING POND	706	652	54	52	0	0	0	0	155	21.9%	A	1.42	0.00	0.00	0.00	0.00	1.42	C
44	HERRING BROOK / GREAT POND	884	677	207	0	0	0	0	0	0	0.0%	D	1.25	0.00	0.00	0.00	0.00	1.25	C
45	WELLFLEET HARBOR	17235	12323	4912	2468	0	0	0	0	5560	32.3%	A	5.81	0.00	0.00	0.00	0.00	5.81	A
46	PAMET RIVER / LITTLE PAMET RIVER	3453	3399	53	0	0	0	0	0	19	0.5%	C	5.53	0.00	0.00	0.00	0.00	5.53	A
47	PROVINCETOWN HARBOR	7821	3633	4188	0	0	0	0	0	399	5.1%	B	1.17	0.00	0.00	0.00	0.00	1.17	C

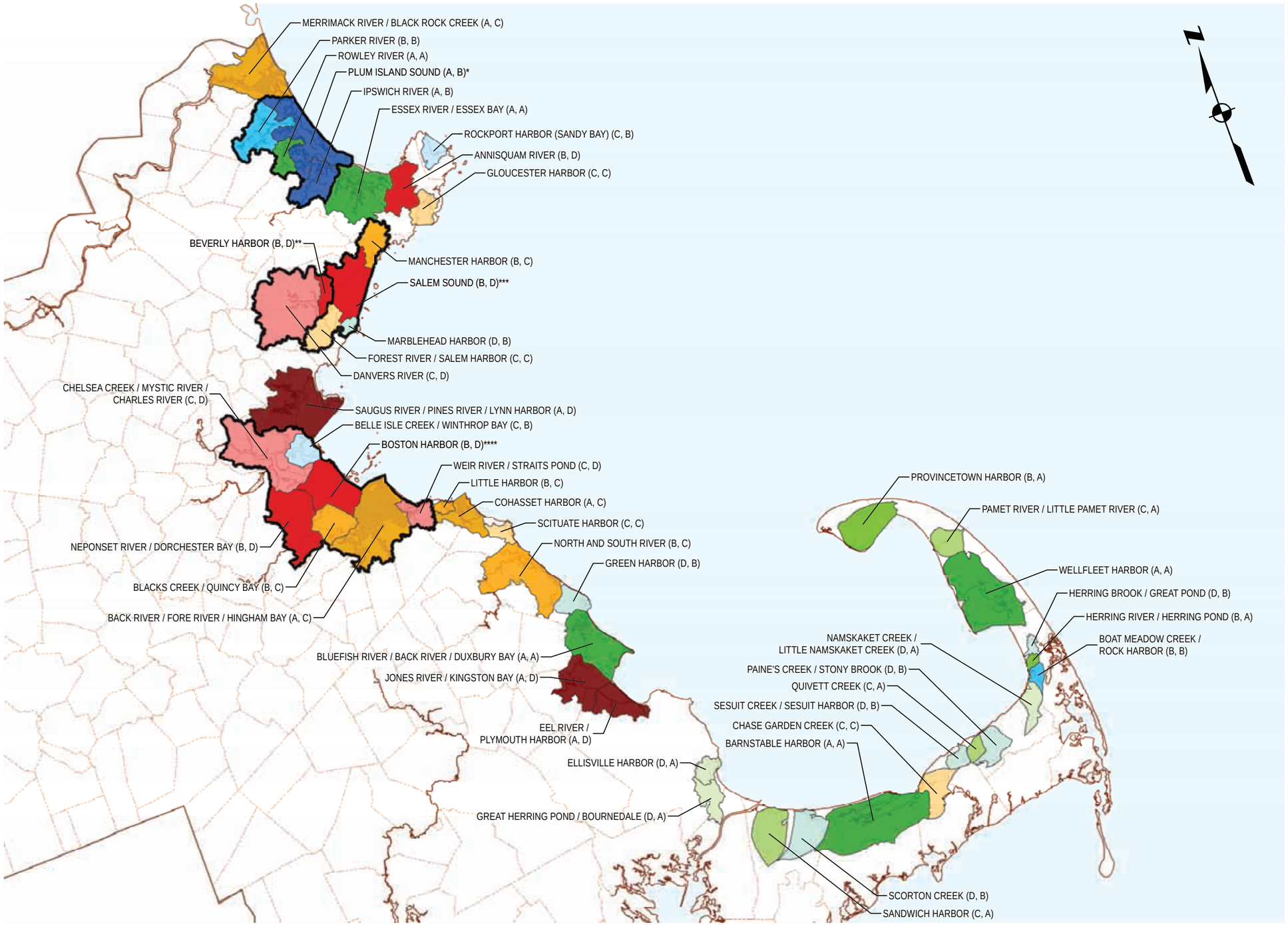
TABLE OF INDICATOR STATISTICS:
RESOURCES (REGIONAL ANALYSIS)

					Shorebird Nesting Sites													
ID	ESTUARINE WATERSHE NAME	Total Watershed Area	Area of Land (acres)	Area of Open Water (acres)	American black duck	Black-crowned night-heron	Canada goose	Colonial waterbirds	Common tern	Double-crested cormorant	Great black-backed gull	Herring gull	Laughing gull	Least tern	Yellow-crowned night-heron	Total Nesting Sites	Nesting Sites per Acre	Nesting Site Ranking
1	MERRIMACK RIVER / BLACK ROCK CREEK	12940	11199	1741	0.00	0.00	0.00	0.00	0.00	0.00	0	1	0	0	0	1	0.00008	B
2	PARKER RIVER	7660	7198	462	0.00	0.00	0.00	0.00	0.00	0.00	0	0	0	0	0	0	0.00000	D
3	ROWLEY RIVER	3185	2936	249	0.00	0.00	0.00	0.00	0.00	0.00	0	0	0	0	0	0	0.00000	D
4	IPSWICH RIVER	6024	5637	387	0.00	0.00	0.00	0.00	0.00	0.00	0	0	0	0	0	0	0.00000	D
5	PLUM ISLAND SOUND	29000	24063	4937	0.00	0.00	0.00	0.00	0.00	0.00	0	0	0	0	0	0	0.00000	D
6	ESSEX RIVER / ESSEX BAY	12369	10984	1385	0.00	0.00	0.00	0.00	0.00	0.00	0	0	0	0	0	0	0.00000	D
7	ANNISQUAM RIVER	5649	4883	766	0.00	0.00	0.00	0.00	0.00	0.00	0	0	0	0	0	0	0.00000	D
8	ROCKPORT HARBOR (SANDY BAY)	2477	1554	923	0.00	0.00	0.00	0.00	0.00	0.00	0	0	0	0	0	0	0.00000	D
9	GLOUCESTER HARBOR	3115	1602	1513	0.00	0.00	0.00	0.00	0.00	0.00	1	1	0	0	0	2	0.00064	A
10	MANCHESTER HARBOR	4296	3967	329	0.00	0.00	1.00	0.00	0.00	0.00	1	0	0	0	0	2	0.00047	A
11	DANVERS RIVER	18346	17740	606	0.00	0.00	0.00	0.00	0.00	0.00	0	0	0	0	0	0	0.00000	D
12	BEVERLY HARBOR	20573	19379	1194	0.00	0.00	0.00	0.00	0.00	0.00	0	0	0	0	0	0	0.00000	D
13	FOREST RIVER / SALEM HARBOR	4798	3655	1143	0.00	0.00	0.00	0.00	0.00	0.00	0	0	0	0	0	0	0.00000	D
14	MARBLEHEAD HARBOR	1143	785	359	0.00	0.00	0.00	0.00	0.00	0.00	0	0	0	0	0	0	0.00000	D
15	SALEM SOUND	40124	32009	8114	0.00	1.00	1.00	2.00	0.00	3.00	4	3	0	0	0	14	0.00035	B
16	SAUGUS RIVER / PINES RIVER / LYNN HARBOR	17132	10864	6269	0.00	0.00	0.00	0.00	1.00	0.00	0	0	0	0	0	1	0.00006	C
17	BELLE ISLE CREEK / WINTHROP BAY	3644	3062	582	0.00	0.00	0.00	0.00	0.00	0.00	0	0	0	0	0	0	0.00000	D
18	CHELSEA CREEK / MYSTIC RIVER / CHARLES RIVER	16388	13862	2526	0.00	0.00	0.00	0.00	0.00	0.00	2	2	0	0	0	4	0.00024	C
19	NEPONSET RIVER / DORCHESTER BAY	11823	9665	2157	0.00	0.00	0.00	0.00	0.00	0.00	2	2	0	0	0	4	0.00034	B
20	BLACKS CREEK / QUINCY BAY	5331	1825	3506	0.00	0.00	0.00	0.00	0.00	0.00	1	1	0	0	0	2	0.00038	A
21	BACK RIVER / FORE RIVER / HINGHAM BAY	17864	10207	7657	1.00	2.00	0.00	0.00	0.00	0.00	2	4	0	0	1	10	0.00056	A
22	WEIR RIVER / STRAITS POND	3451	2816	635	0.00	0.00	0.00	0.00	0.00	0.00	0	0	0	0	0	0	0.00000	D
23	BOSTON HARBOR	67679	42415	25264	1.00	2.00	0.00	1.00	1.00	0.00	7	9	0	0	1	22	0.00033	B
24	LITTLE HARBOR	979	838	142	0.00	0.00	0.00	0.00	0.00	0.00	0	0	0	0	0	0	0.00000	D
25	COHASSET HARBOR	4811	4291	520	0.00	0.00	0.00	0.00	0.00	0.00	1	1	0	0	0	2	0.00042	A
26	SCITUATE HARBOR	1764	1616	148	0.00	0.00	0.00	0.00	0.00	0.00	0	0	0	0	0	0	0.00000	D
27	NORTH RIVER / SOUTH RIVER	13590	12859	730	0.00	0.00	0.00	0.00	0.00	0.00	0	0	0	0	0	0	0.00000	D
28	GREEN HARBOR	3071	2795	276	0.00	0.00	0.00	0.00	0.00	0.00	0	0	0	0	0	0	0.00000	D
29	BLUEFISH RIVER / BACK RIVER / DUXBURY BAY	10398	5000	5398	0.00	0.00	0.00	0.00	0.00	1.00	1	1	0	0	0	3	0.00029	B
30	JONES RIVER / KINGSTON BAY	7861	4923	2938	0.00	0.00	0.00	0.00	0.00	0.00	0	0	0	0	0	0	0.00000	D
31	EEL RIVER / PLYMOUTH HARBOR	5290	3617	1673	0.00	0.00	0.00	0.00	0.00	0.00	1	1	1	1	0	4	0.00076	A
32	ELLISVILLE HARBOR	2188	2020	167	0.00	0.00	0.00	0.00	0.00	0.00	0	0	0	0	0	0	0.00000	D
33	GREAT HERRING POND / BOURNEDALE	3498	2885	613	0.00	0.00	0.00	0.00	0.00	0.00	0	0	0	0	0	0	0.00000	D
34	SANDWICH HARBOR	7124	7008	116	0.00	0.00	0.00	0.00	0.00	0.00	0	0	0	0	0	0	0.00000	D
35	SCORTON CREEK	6383	6169	214	0.00	0.00	0.00	0.00	0.00	0.00	0	0	0	0	0	0	0.00000	D
36	BARNSTABLE HARBOR	20142	18206	1936	0.00	0.00	0.00	0.00	0.00	0.00	0	0	0	0	0	0	0.00000	D
37	CHASE GARDEN CREEK	4801	4634	167	0.00	0.00	0.00	0.00	0.00	0.00	0	0	0	0	0	0	0.00000	D
38	SESUIT CREEK / SESUIT HARBOR	1695	1586	109	0.00	0.00	0.00	0.00	0.00	0.00	0	0	0	0	0	0	0.00000	D
39	QUIVETT CREEK	1470	1447	23	0.00	0.00	0.00	0.00	0.00	0.00	0	0	0	0	0	0	0.00000	D
40	PAINE'S CREEK / STONY BROOK	3702	3301	401	0.00	0.00	0.00	0.00	0.00	0.00	0	0	0	0	0	0	0.00000	D
41	NAMSKAKET CREEK / LITTLE NAMSKAKET CREEK	2976	2669	307	0.00	0.00	0.00	0.00	0.00	0.00	0	0	0	0	0	0	0.00000	D
42	BOAT MEADOW CREEK / ROCK HARBOR	1315	1279	37	0.00	0.00	0.00	0.00	0.00	0.00	0	0	0	0	0	0	0.00000	D
43	HERRING RIVER / HERRING POND	706	652	54	0.00	0.00	0.00	0.00	0.00	0.00	0	0	0	0	0	0	0.00000	D
44	HERRING BROOK / GREAT POND	884	677	207	0.00	0.00	0.00	0.00	0.00	0.00	0	0	0	0	0	0	0.00000	D
45	WELLFLEET HARBOR	17235	12323	4912	0.00	0.00	0.00	0.00	0.00	0.00	0	0	0	0	0	0	0.00000	D
46	PAMET RIVER / LITTLE PAMET RIVER	3453	3399	53	0.00	0.00	0.00	0.00	0.00	0.00	0	0	0	0	0	0	0.00000	D
47	PROVINCETOWN HARBOR	7821	3633	4188	0.00	0.00	0.00	0.00	0.00	1.00	0	0	0	0	0	1	0.00013	A

APPENDIX F

MAPS, INDICATOR ANALYSIS, ENTIRE STUDY AREA

Path: Q:\GISProjects\BW0208-MassBays_Estuary\Projects\RANKING_STRESSOR_RESOURCE.mxd



Legend

STRESSOR SCALE					
	D	(D,D)	(C,D)	(B,D)	(A,D) (High Priority)
	C	(D,C)	(C,C)	(B,C)	(A,C)
	B	(D,B)	(C,B)	(B,B)	(A,B)
	A	(D,A) (Low Priority)	(C,A)	(B,A)	(A,A)
		D	C	B	A
		RESOURCE SCALE			

ESTUARY NAME (RESOURCE RANK, STRESSOR RANK)

Notes:
1. Resource and Stressor rankings represent the total score for each category based on the set of individual indicators. A, B, C, and D rankings correspond to the estuarine watershed's position in ranked quartiles of the watersheds.
2. An "A" ranking for resources represents a high resource value for the given watershed. An "A" ranking for stressors represents a low stressor value for the watershed.

* Plum Island Sound includes Parker River, Rowley River, and Ipswitch River.
** Beverly Harbor includes Danvers River
*** Salem Sound includes Marblehead Harbor, Forest River / Salem Harbor Complex, Beverly Harbor, Danvers River, and Manchester Harbor.
**** Boston Harbor includes Weir River / Straits Pond, Back River / Fore River / Hingham Bay, Blacks Creek / Quincy Bay, Neponset River / Dorchester Bay, Chelsea Creek / Mystic River / Charles River, and Belle Isle Creek / Winthrop Bay.

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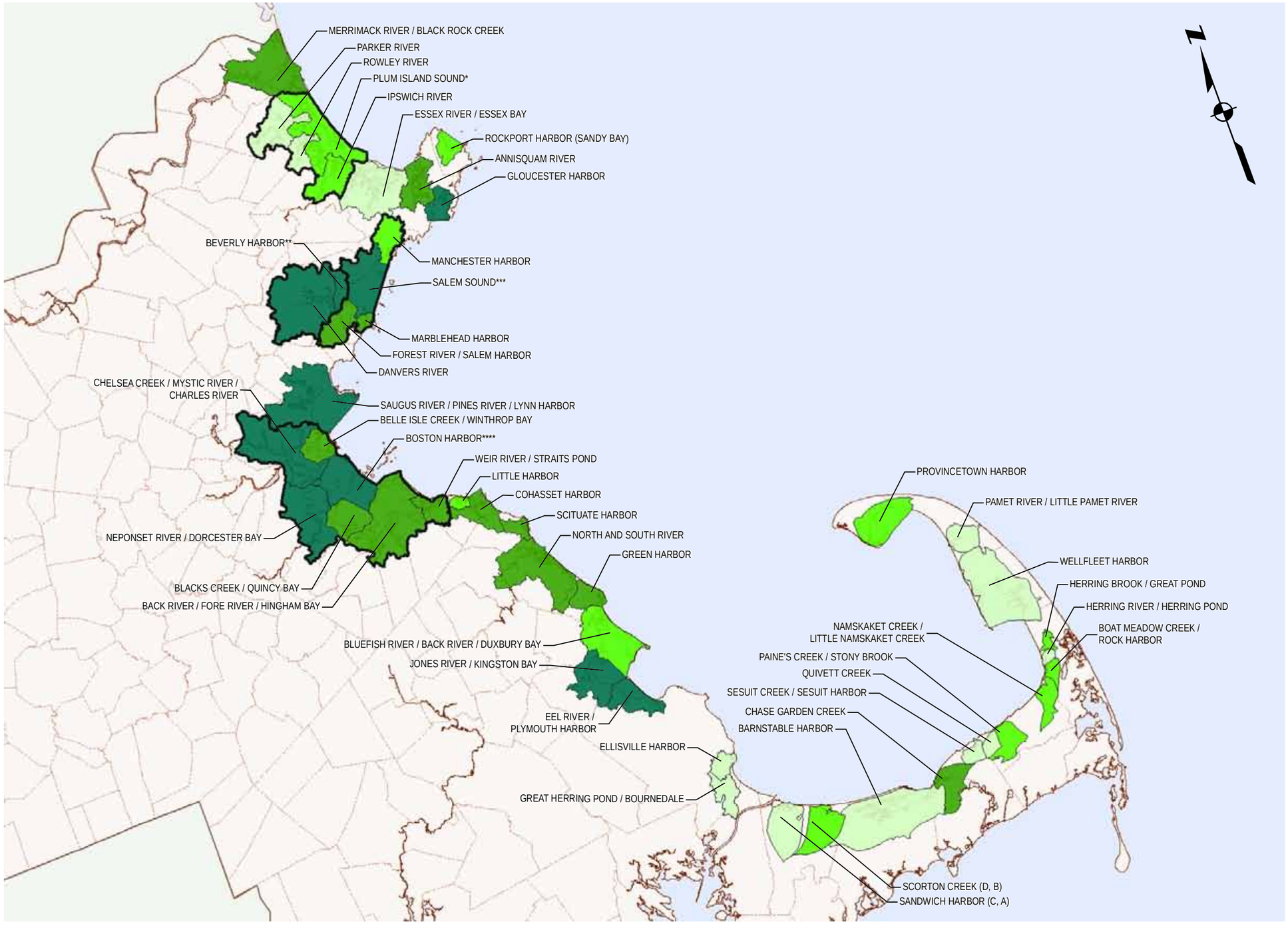
10 5 0 10 20 Miles

MASSACHUSETTS BAYS ESTUARIES COMPARITIVE ANALYSIS: RESOURCES AND STRESSORS

Map 1 of 4

Path: Q:\GISProjects\BW0208-MassBays_Estuary\Projects\RANKING_MP1.mxd



Legend

- Estuarine Watershed Boundary
- Boundary of nested subwatersheds

Management Priority 1 Ranking

- A (Low Priority)
- B
- C
- D (High Priority)
- ESTUARY NAME

Notes:
1. Management Priority 1 ranking scores are based on the sum of the ranking scores for each indicator listed as part of this management priority as shown in Appendix E.
2. An "A" ranking for resources represents a low management priority value for the watershed with respect to Management Priority 1.

The priority ranking for subwatershed areas labeled in bold text indicates the overall ranking for the subwatershed, which includes nested subwatersheds that were also ranked seperately, as follows:

* Plum Island Sound includes Parker River, Rowley River, and Ipswitch River.
** Beverly Harbor includes Danvers River
*** Salem Sound includes Marblehead Harbor, Forest River / Salem Harbor Complex, Beverly Harbor, Danvers River, and Manchester Harbor.
**** Boston Harbor includes Weir River / Straits Pond, Back River / Fore River / Hingham Bay, Blacks Creek / Quincy Bay, Neponset River / Dorchester Bay, Chelsea Creek / Mystic River / Charles River, and Belle Isle Creek / Winthrop Bay.

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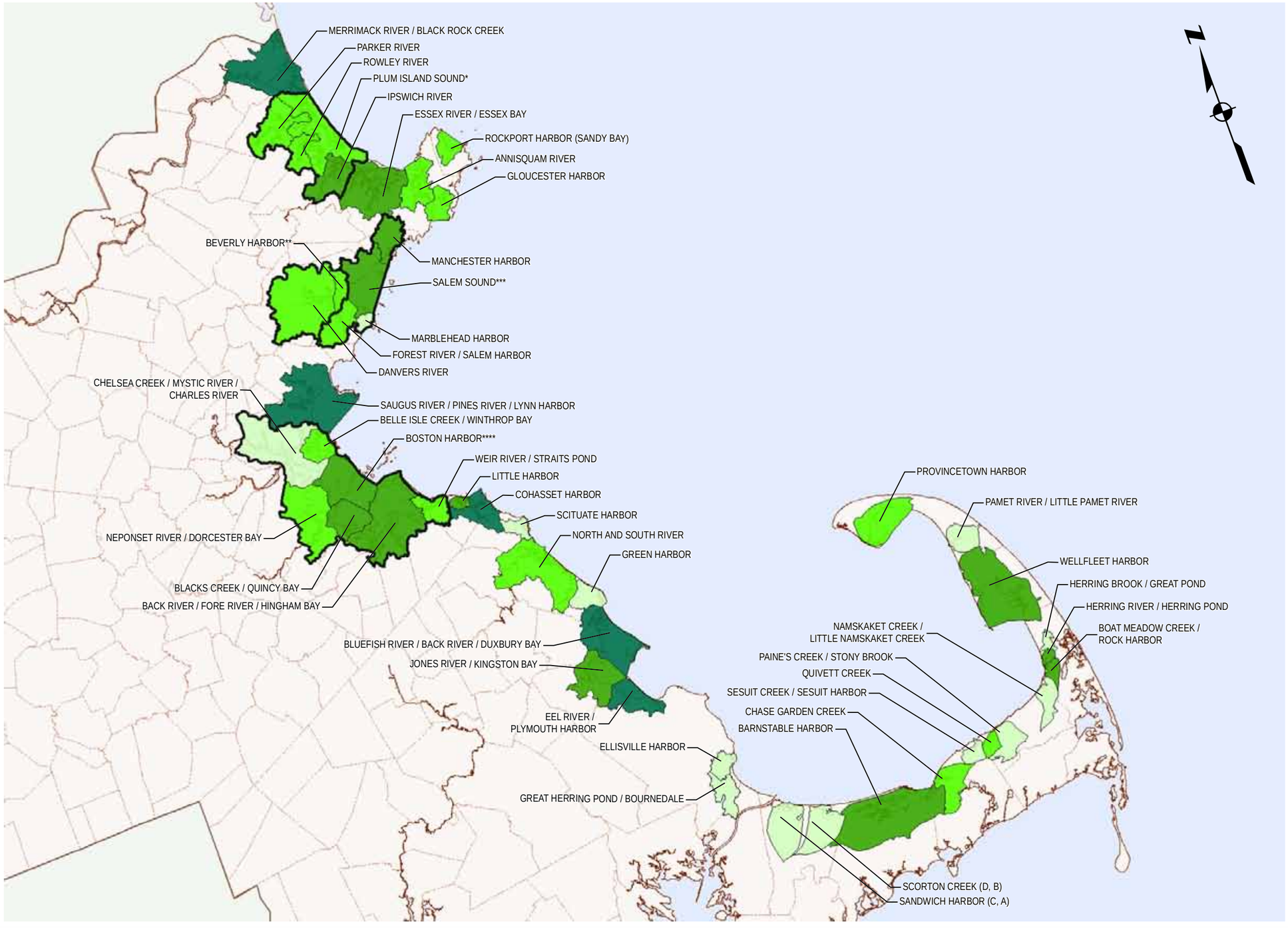
10 5 0 10 20 Miles

MANAGEMENT PRIORITY 1 RANKING:
Reduce bacterial contamination and minimize the risk of eutrophication

Path: Q:\GISProjects\BW0208-MassBays_Estuary\Projects\RANKING_MP2.mxd



Legend

- Estuarine Watershed Boundary
- Boundary of nested subwatersheds

Management Priority 2 Ranking

- A (Low Priority)
- B
- C
- D (High Priority)
- ESTUARY NAME

Notes:
1. Management Priority 1 ranking scores are based on the sum of the ranking scores for each indicator listed as part of this management priority as shown in Appendix E.
2. An "A" ranking for resources represents a low management priority value for the watershed with respect to Management Priority 1.

The priority ranking for subwatershed areas labeled in bold text indicates the overall ranking for the subwatershed, which includes nested subwatersheds that were also ranked seperately, as follows:

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*** Salem Sound includes Marblehead Harbor, Forest River / Salem Harbor Complex, Beverly Harbor, Danvers River, and Manchester Harbor.
**** Boston Harbor includes Weir River / Straits Pond, Back River / Fore River / Hingham Bay, Blacks Creek / Quincy Bay, Neponset River / Dorchester Bay, Chelsea Creek / Mystic River / Charles River, and Belle Isle Creek / Winthrop Bay.

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10 5 0 10 20 Miles

MANAGEMENT PRIORITY 2 RANKING:
Protect and restore sensitive estuarine habitat

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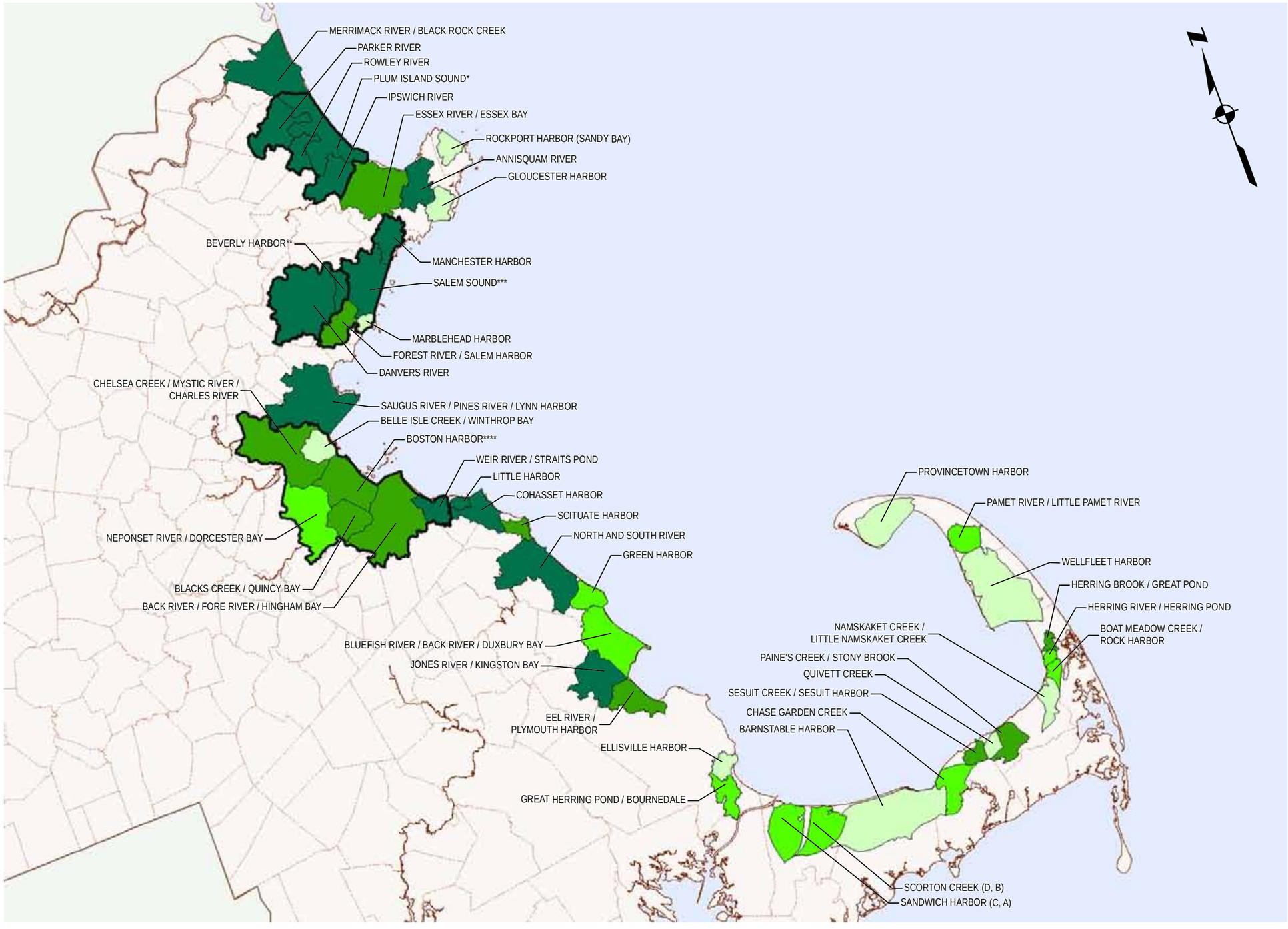

Legend

- Estuarine Watershed Boundary
- Boundary of nested subwatersheds

Management Priority 3 Ranking

- A (Low Priority)
- B
- C
- D (High Priority)
- ESTUARY NAME

Notes:
1. Management Priority 1 ranking scores are based on the sum of the ranking scores for each indicator listed as part of this management priority as shown in Appendix E.
2. An "A" ranking for resources represents a low management priority value for the watershed with respect to Management Priority 1.

The priority ranking for subwatershed areas labeled in bold text indicates the overall ranking for the subwatershed, which includes nested subwatersheds that were also ranked seperately, as follows:

* Plum Island Sound includes Parker River, Rowley River, and Ipswitch River.
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*** Salem Sound includes Marblehead Harbor, Forest River / Salem Harbor Complex, Beverly Harbor, Danvers River, and Manchester Harbor.
**** Boston Harbor includes Weir River / Straits Pond, Back River / Fore River / Hingham Bay, Blacks Creek / Quincy Bay, Neponset River / Dorchester Bay, Chelsea Creek / Mystic River / Charles River, and Belle Isle Creek / Winthrop Bay.

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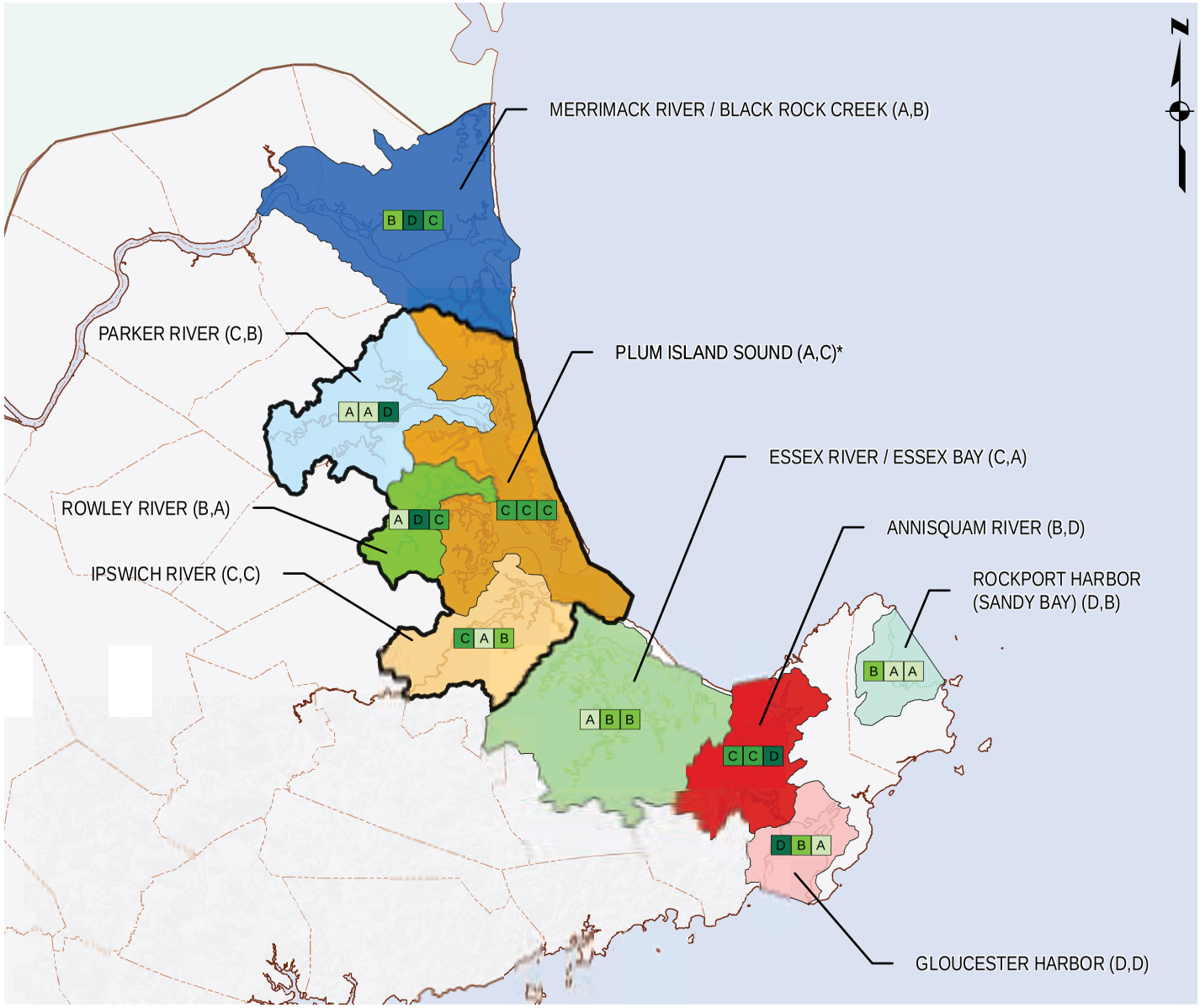
10 5 0 10 20 Miles

MANAGEMENT PRIORITY 3 RANKING: Improve continuity of estuarine habitats

Map 4 of 4

APPENDIX G

MAPS, INDICATOR ANALYSIS, REGIONAL ANALYSIS



Legend

STRESSOR SCALE	RESOURCE SCALE: D	C	B	A
D	(D,D)	(C,D)	(B,D)	(A,D) (High Priority)
C	(D,C)	(C,C)	(B,C)	(A,C)
B	(D,B)	(C,B)	(B,B)	(A,B)
A	(D,A) (Low Priority)	(C,A)	(B,A)	(A,A)

ESTUARY NAME
(RESOURCE RANK, STRESSOR RANK)

BOUNDARY OF NESTED SUBWATERSHED AREA

A A A

MANAGEMENT PRIORITY 3 RANK
(Improve continuity of estuarine habitat)

MANAGEMENT PRIORITY 2 RANK
(Protect/restore estuarine habitat)

MANAGEMENT PRIORITY 1 RANK
(Reduce bacteria/minimize eutrophication)

Management Priority Ranking

- A - Low Priority
- B
- C
- D - High Priority

* Plum Island Sound includes Parker River, Rowley River, and Ipswitch River.
** Beverly Harbor includes Danvers River
*** Salem Sound includes Marblehead Harbor, Forest River / Salem Harbor Complex, Beverly Harbor, Danvers River, and Manchester Harbor.
**** Boston Harbor includes Weir River / Straits Pond, Back River / Fore River / Hingham Bay, Blacks Creek / Quincy Bay, Neponset River / Dorchester Bay, Chelsea Creek / Mystic River / Charles River, and Belle Isle

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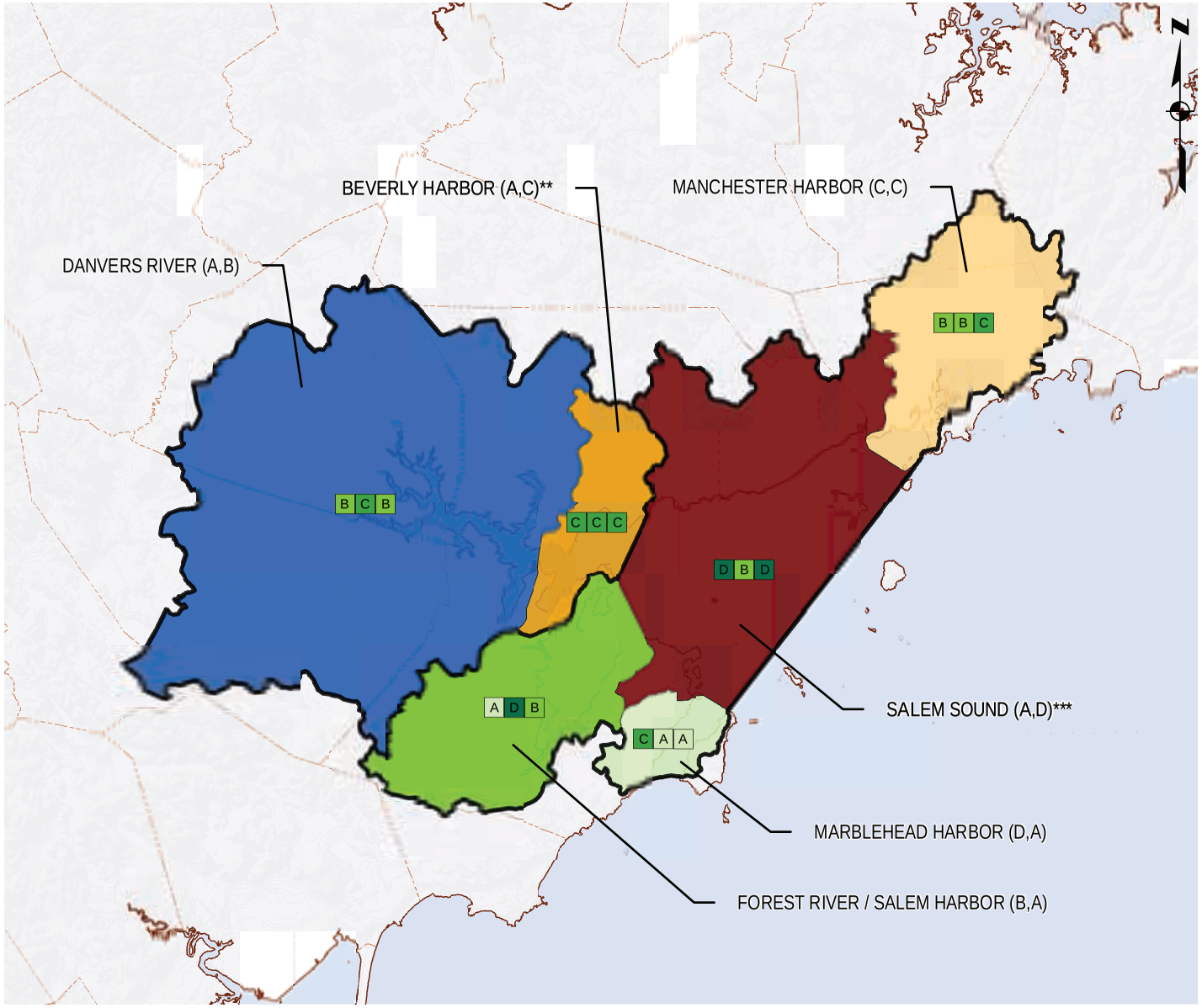
NORTH SHORE INTRA-REGIONAL PRIORITY ANALYSIS



Legend

STRESSOR SCALE	RESOURCE SCALE: D	C	B	A
D	(D,D)	(C,D)	(B,D)	(A,D) (High Priority)
C	(D,C)	(C,C)	(B,C)	(A,C)
B	(D,B)	(C,B)	(B,B)	(A,B)
A	(D,A) (Low Priority)	(C,A)	(B,A)	(A,A)

ESTUARY NAME
(RESOURCE RANK, STRESSOR RANK)

BOUNDARY OF NESTED SUBWATERSHED AREA

A A A
MANAGEMENT PRIORITY 3 RANK
(Improve continuity of estuarine habitat)
MANAGEMENT PRIORITY 2 RANK
(Protect/restore estuarine habitat)
MANAGEMENT PRIORITY 1 RANK
(Reduce bacteria/minimize eutrophication)

Management Priority Ranking
- A - Low Priority
- B
- C
- D - High Priority

* Plum Island Sound includes Parker River, Rowley River, and Ipswitch River.
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*** Salem Sound includes Marblehead Harbor, Forest River / Salem Harbor Complex, Beverly Harbor, Danvers River, and Manchester Harbor.
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Bay, Chelsea Creek / Mystic River / Charles River, and Belle Isle

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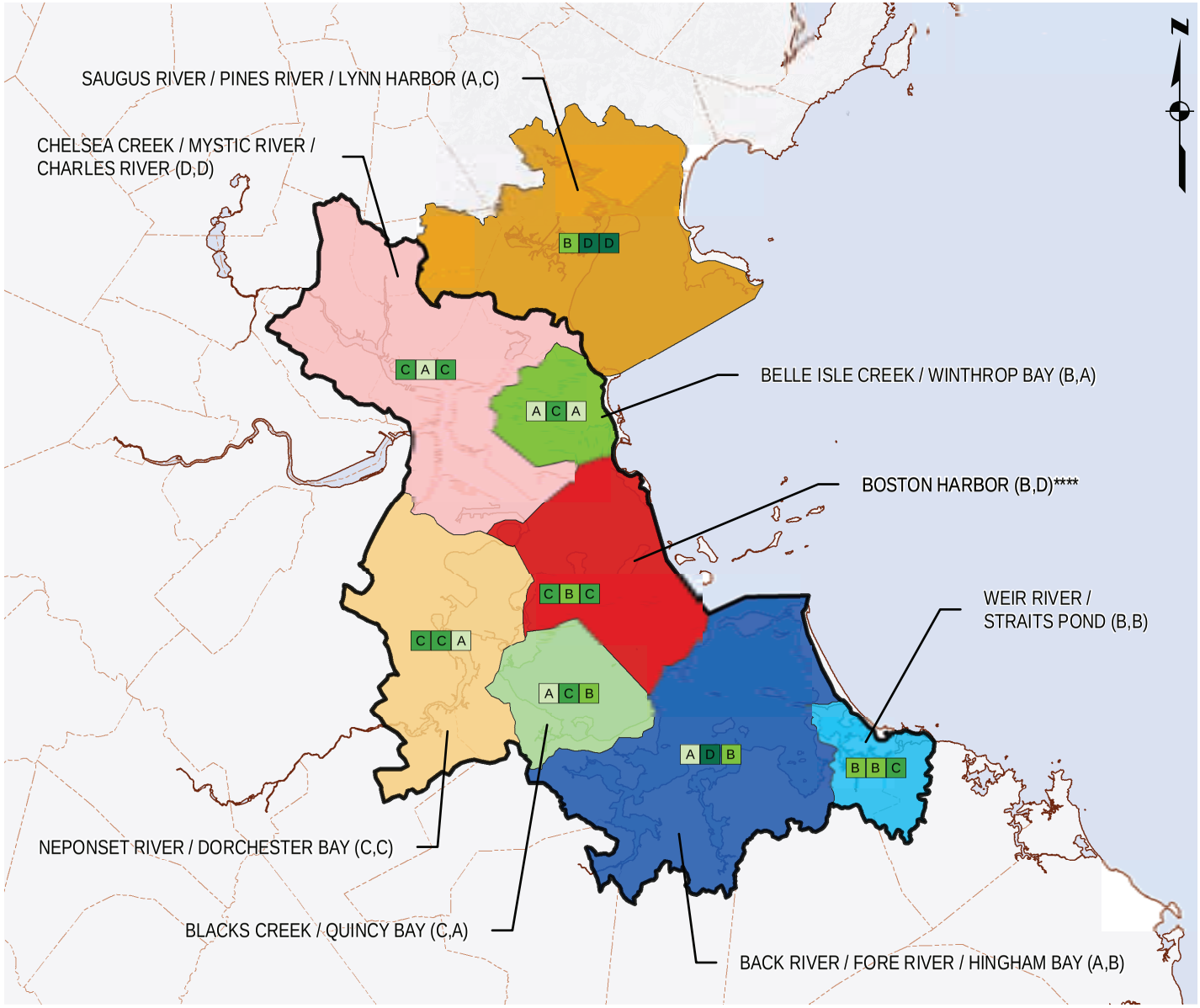
SALEM SOUND
INTRA-REGIONAL PRIORITY ANALYSIS



Legend

STRESSOR SCALE					
	D	(D,D)	(C,D)	(B,D)	(A,D) (High Priority)
	C	(D,C)	(C,C)	(B,C)	(A,C)
	B	(D,B)	(C,B)	(B,B)	(A,B)
	A	(D,A) (Low Priority)	(C,A)	(B,A)	(A,A)
		D	C	B	A
		RESOURCE SCALE			

ESTUARY NAME
(RESOURCE RANK, STRESSOR RANK)

BOUNDARY OF NESTED SUBWATERSHED AREA

A A A

MANAGEMENT PRIORITY 3 RANK
(Improve continuity of estuarine habitat)

MANAGEMENT PRIORITY 2 RANK
(Protect/restore estuarine habitat)

MANAGEMENT PRIORITY 1 RANK
(Reduce bacteria/minimize eutrophication)

Management Priority Ranking

- A - Low Priority
- B
- C
- D - High Priority

* Plum Island Sound includes Parker River, Rowley River, and Ipswitch River.
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**** Boston Harbor includes Weir River / Straits Pond, Back River / Fore River / Hingham Bay, Blacks Creek / Quincy Bay, Neponset River / Dorchester Bay, Chelsea Creek / Mystic River / Charles River, and Belle Isle

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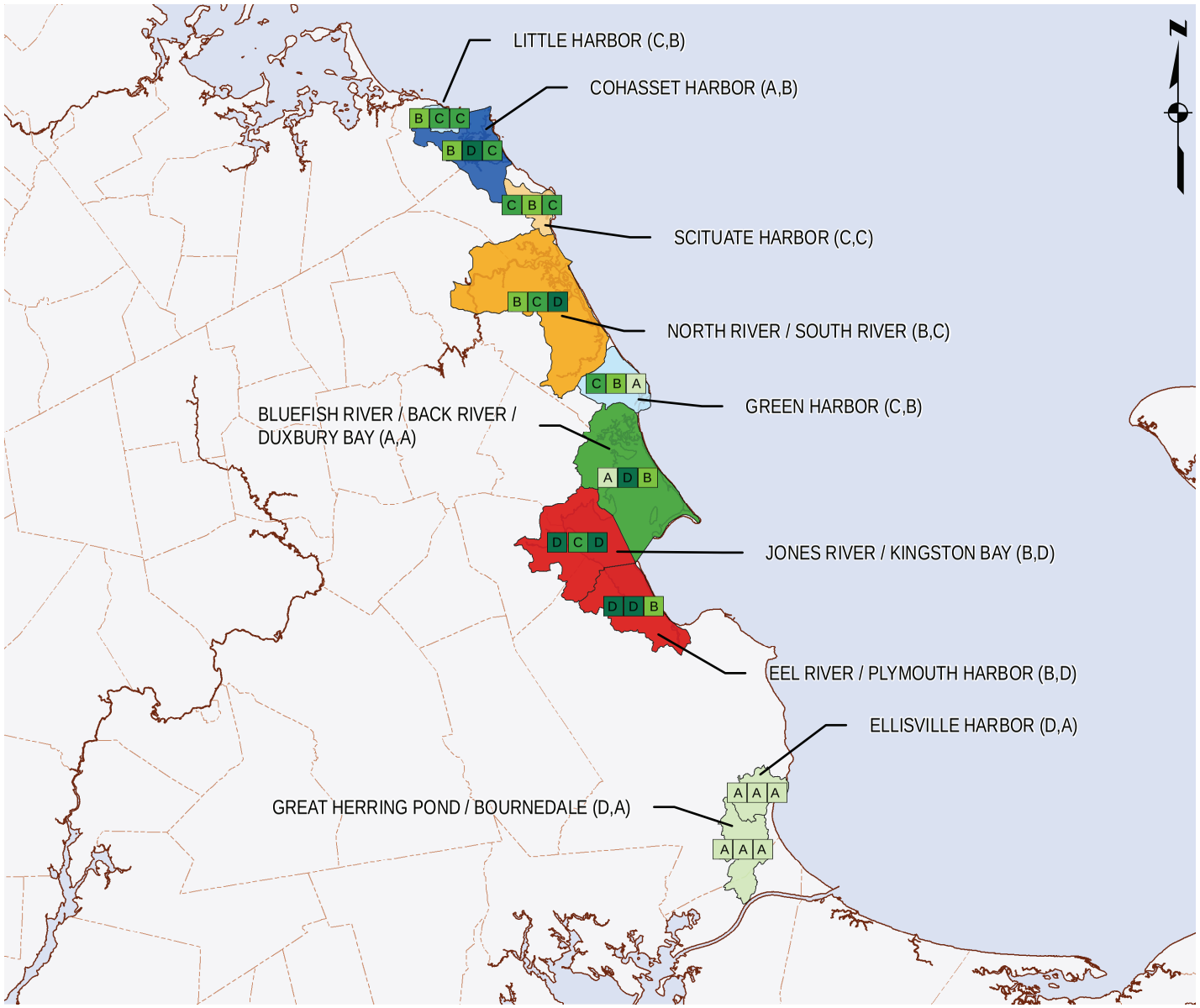
METRO BOSTON
INTRA-REGIONAL PRIORITY ANALYSIS



Legend

STRESSOR SCALE	RESOURCE SCALE: D	C	B	A
D	(D,D)	(C,D)	(B,D)	(A,D) (High Priority)
C	(D,C)	(C,C)	(B,C)	(A,C)
B	(D,B)	(C,B)	(B,B)	(A,B)
A	(D,A) (Low Priority)	(C,A)	(B,A)	(A,A)

ESTUARY NAME
(RESOURCE RANK, STRESSOR RANK)

BOUNDARY OF NESTED
SUBWATERSHED AREA

A A A

MANAGEMENT PRIORITY 3 RANK
(Improve continuity of estuarine habitat)

MANAGEMENT PRIORITY 2 RANK
(Protect/restore estuarine habitat)

MANAGEMENT PRIORITY 1 RANK
(Reduce bacteria/minimize eutrophication)

Management Priority Ranking

- A - Low Priority
- B
- C
- D - High Priority

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Bay, Chelsea Creek / Mystic River / Charles River, and Belle Isle

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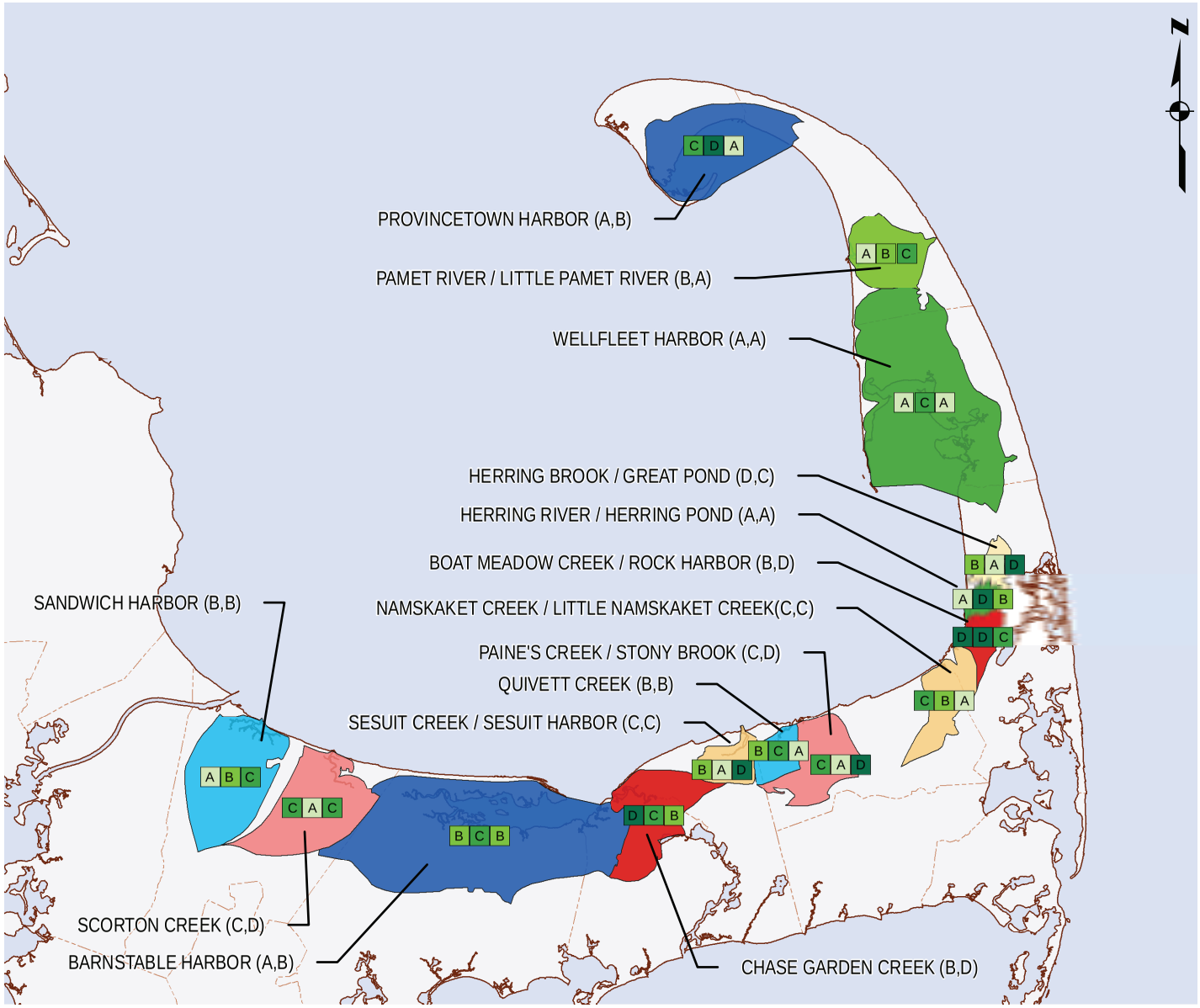
SOUTH SHORE
INTRA-REGIONAL PRIORITY ANALYSIS



Legend

STRESSOR SCALE	RESOURCE SCALE: D	C	B	A
D	(D,D)	(C,D)	(B,D)	(A,D) (High Priority)
C	(D,C)	(C,C)	(B,C)	(A,C)
B	(D,B)	(C,B)	(B,B)	(A,B)
A	(D,A) (Low Priority)	(C,A)	(B,A)	(A,A)

ESTUARY NAME
(RESOURCE RANK, STRESSOR RANK)

BOUNDARY OF NESTED SUBWATERSHED AREA

A A A
MANAGEMENT PRIORITY 3 RANK
(Improve continuity of estuarine habitat)
MANAGEMENT PRIORITY 2 RANK
(Protect/restore estuarine habitat)
MANAGEMENT PRIORITY 1 RANK
(Reduce bacteria/minimize eutrophication)

Management Priority Ranking

- A - Low Priority
- B
- C
- D - High Priority

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*** Salem Sound includes Marblehead Harbor, Forest River / Salem Harbor Complex, Beverly Harbor, Danvers River, and Manchester Harbor.
**** Boston Harbor includes Weir River / Straits Pond, Back River / Fore River / Hingham Bay, Blacks Creek / Quincy Bay, Neponset River / Dorchester
Bay, Chelsea Creek / Mystic River / Charles River, and Belle Isle

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8/30/2012

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INTRA-REGIONAL PRIORITY ANALYSIS

APPENDIX H

INDIVIDUAL ESTUARINE WATERSHED DISCUSSION

ID	NAME	DISCUSSION
1	**MERRIMACK RIVER / BLACK ROCK CREEK**	**Stressors:** Merrimack River/Black Rock Creek Complex received a high priority score for wastewater dicharge to surface water, with three wastewater treatment plants and a total permitted flowrate of 6.6 MGD. Other high-priority stressors include the area of tidally restricted wetlands, and 303(d) impairments of water bodies for bacteria. 303(d) impairments for nutrients and wastewater discharge to groundwater were not a high priority. **Resources:** This watershed recieved high scores on many of the resource indicators, although seagrass extent and shorebird nesting sites were not significant resources for this area. **Priority:** The watershed recieved an **A,C** grade for resources and stressors, respectively, indicating a **high management priority**.
2	**PARKER RIVER**	**Stressors:** Parker River exhibits high amounts of road crossings, road crossings in tidal areas, and area of tidally restricted wetlands. However, high intensity land use, imperviousness, and population are not significant stressors in this watershed. **Resources:** The primary resources in this region are salt marsh extent and anadromous fish run length. **Priority:** This watershed recieved **B,B** grade for resources and stressors, respectively, indicating a **moderate management priority.**
3	**ROWLEY RIVER**	**Stressors:** Rowley River received a high priority score with respect to road crossings in tidal areas and area of tidal restricted wetlands, as well as 303(d) impairments of waterbodies for bacteria. **Resources:** The watershed did not exhibit high amounts of seagrass extent or bird nesting sites, but was among the highest ranked watersheds for salt marsh extent, shellfish habitat, shorebird habitat, and anadromous fish run length. **Priority:** The watershed recieved an **A,A** grade for resources and stressors, respectively, indicating a **moderate management priority.**
4	**IPSWICH RIVER**	**Stressors:** Ipswich River received a high priority score with respect to the area of tidal restricted wetlands, as well as 303(d) impairments of waterbodies for bacteria. Low priority indicators included impervious area, 303(d) impairments for nutrients, and various sources of wastewater. **Resources:** The watershed did not exhibit high amounts of seagrass extent or bird nesting sites, but was among the highest ranked watersheds for salt marsh extent, shellfish habitat, shorebird habitat, and anadromous fish run length. **Priority:** The watershed recieved an **A,B** grade for resources and stressors, respectively, indicating a **moderately high management priority.**
5	**PLUM ISLAND SOUND**	The Plum Island Sound watershed includes the nested subwatersheds Ipswich River, Rowley River, Parker River, and the Merrimack River/ Black Rock Creek Complex. **Stressors:** Plum Island Sound received a high priority score with respect to septic system wastewater discharge. Although its component subwatersheds did not recieve a high priority for this indicator, the combined estimated discharge from septic systems for the entire Plum Island Sound area ranks this watershed among the top quartile of watersheds with respect to septic system use. The watershed also recieved high priority scores for the area of tidal restricted wetlands, as well as 303(d) impairments of waterbodies for bacteria. Low priority indicators included impervious area, high intensity land use, population, and 303(d) impairments for nutrients, **Resources:** The watershed did not exhibit high amounts of seagrass extent or bird nesting sites, but was among the highest ranked watersheds for salt marsh extent, shellfish habitat, shorebird habitat, and anadromous fish run length. **Priority:** The watershed recieved an **A,B** grade for resources and stressors, respectively, indicating a **moderately high management priority.**
6	**ESSEX RIVER / ESSEX BAY**	**Stressors:** Essex River/ Essex Bay complex received a high priority score for 303(d) listed impairments for bacteria to both waterbodies and streams. It also received moderately high priority rankings for septic system use, road crossings, and road crossings within tidal areas. **Resources**: The watershed did not exhibit high amounts of seagrass extent or bird nesting sites, but was among the highest ranked watersheds for all other resource indicators. **Priority:** The watershed recieved an **A,A** grade for resources and stressors, respectively, indicating a **moderate management priority.**

ID	NAME	DISCUSSION
7	**ANNISQUAM RIVER**	**Stressors:** Annisquam river received high priority scores for all stressor indicators related to road crossings and tidal restrictions. **Resources**: The watershed does not include a high amount of bird habitat or bird nesting sites, although it does recieve a high resource priority due to the presence of tidal flats and shellfish habitat. **Priority:** The watershed recieved an **B,D** grade for resources and stressors, respectively, indicating a high to moderately high management priority.
8	**ROCKPORT HARBOR (SANDY BAY)**	**Stressors:** Rockport Harbor (Sandy Bay) received high priority scores due to the amount of "prohibited" Designated Shellfish Growing Areas, and moderately high priority scores with respect to land use, stormwater runoff, impervious area, and population. **Resources:** Important estuarine resources included shellfish habitat, although the watershed did not have a high priority with respect to tidal flats, salt marsh extent, or anadromous fish runs. **Priority:** The watershed recieved an **C,B** grade for resources and stressors, respectively, indicating a **moderately low management priority.**
9	**GLOUCESTER HARBOR**	**Stressors:** Gloucester Harbor received high priority scores with respect to septic system use (0.33 MGD) as well as wastewater discharges to surface water (7.2 MGD) Other high priority stressors include stormwater runoff volume and population. Another high priority is the amount of prohibited Designated Shellfish Growing Areas. **Resources:** Gloucester Harbor high priority resources included shorebird nesting sites as well as a moderately high presence of seagrass. The harbor recieved low priority scores for the other types of resource indicators. **Priority:** The watershed recieved a **C,C** grade for resources and stressors, respectively, indicating a **moderate management priority.**
10	**MANCHESTER HARBOR**	**Stressors:** Manchester Harbor received a high stressor priority score due to the number of road crossings and the number of road crossings withing tidal areas. It also received high priority ranking for 303(d) impairments of waterbodies and streams for bacteria. The percentage of prohibited Designated Shellfish Growing areas is also a high priority concern for this watershed. **Resources:** Major resources within the estuarine watershed included seagrass and shorebird nesting sites. Other indicators of estuarine resources recieved low priority scores. **Priority:** The watershed recieved a **B,C** grade for resources and stressors, respectively, indicating a **moderately high management priority.**
11	**DANVERS RIVER**	**Stressors:** Danvers River received high priority rankings for high intensity land use, stormwater runoff volume, and impervious area. Road crossings and impoundments that cause barriers to fish passage are also high priority stressors for this watershed. Wastewater from various sources is most likely a low priority indicator for this watershed. **Resources:** The watershed did not recieve any of the highest priority rankings for resources. However, it did rank in the second highest quartile with respect to tidal flats, shellfish and shorebird habitat, and anadromous fish runs. **Priority:** The watershed recieved a **C,D** grade for resources and stressors, respectively, indicating a **moderately high management priority.**
12	**BEVERLY HARBOR**	**Stressors:** Beverly Harbor includes Danvers River as a subwatershed. It received high priority rankings for high intensity land use, stormwater runoff volume, population, and impervious area. Road crossings and impoundments that cause barriers to fish passage are also high priority stressors for this watershed. Wastewater from various sources is most likely a low priority indicator for this watershed. **Resources:** The watershed did not recieve any of the highest priority rankings for resources. However, it did rank in the second highest quartile with respect to tidal flats, shellfish and shorebird habitat, seagrass extent, and anadromous fish runs. **Priority:** The watershed recieved a **B,D** grade for resources and stressors, respectively, indicating a **high management priority.**

ID	NAME	DISCUSSION
13	**FOREST RIVER / SALEM HARBOR**	**Stressors**: Forest River/ Salem Harbor Complex received high priority rankings for high intensity land use, stormwater runoff volume, population, and impervious area. Road crossings were also a high priority stressor for this watershed. Wastewater from various sources is most likely a low priority indicator for this watershed. **Resources:** The watershed ranked lowly with respect to resources, but did have scores in the second highest quartile for seagrass extent and shorebird habitat. **Priority:** The watershed recieved a **C,C** grade for resources and stressors, respectively, indicating a **moderate management priority.**
14	**MARBLEHEAD HARBOR**	**Stressors:** Marblehead Harbor received high priority rankings for high intensity land use, stormwater runoff volume, population, and impervious area. 303(d) impairments for bacteria were also a high priority stressor for this watershed. Wastewater from various sources is most likely a low priority indicator for this watershed, along with road crossings and other tidal restrictions. **Resources:** Marblehead Harbor recieved the lowest ranking on a majority of resource indicators, except for seagrass extent, for which it ranked in the second highest quartile. **Priority:** The watershed recieved a **D,B** grade for resources and stressors, respectively, indicating a **low management priority.**
15	**SALEM SOUND**	**Stressors:** Salem Sound contains Manchester Harbor, Danvers River, Beverly Harbor, Marblehead Harbor, and Forest River/ Salem Harbor Complex as subwatersheds. It received high stressor rankings for high intensity land use, stormwater runoff volume, and impervious area. All designated shellfish growing areas within this estuary are listed as 'prohibited.' Additionally, the watershed ranked in the top quartile with respect to impoundments that cause fish passage barriers and road crossings. **Resources:** Salem Sound did not rank highly with respect to resources. However, it recieved scores within the second highest quartile for the resource indicators for seagrass extent, shorebird habitat, shorebird nesting sites, and anadromous fish runs. Salt marsh extent is not a high priority resource within this watershed. **Priority:** Salem sound recieved a **B,D** score for resources and stressors, respectively, indicating a **high management priority.**
16	**SAUGUS RIVER / PINES RIVER / LYNN HARBOR**	**Stressors:** Saugus River/ Pines River/ Lynn Harbor received high priority scores for the majority of the stressor indicators. The watershed ranked in the highest quartile for high intensity land use, stormwater runoff volume, imperious area, and population. Additionally, it ranked highly for wastewater discharges to surface water, with a permitted flowrate of 25.8 MGD. Bacteria is a high priority concern for this watershed, with 100% of its waterbodies and streams being listed for impairments for bacteria. **Resources:** The watershed also recieved high rankings with respect to resources. It ranked in the top quartile with respect to seagrass extent, and in the second highest quartile with respect to salt marsh extent, tidal flat extent, shorebird habitat, and anadromous fish runs. **Priority:** Because it contains a high resource value while simultaneously exhibiting a number of ecological stressors, Saugus River/ Pines River/ Lynn Harbor recieved an **A,D** score for resources and stressors, respectively, indicating a **high management priority**.
17	**BELLE ISLE CREEK / WINTHROP BAY**	**Stressors:** Belle Isle Creek/ Winthrop Bay received high stressor rankings for high intensity land use, stormwater runoff volume, and impervious area. Wastewater sources, 303(d) impairments, and crossings/restrictions were not a management priority within this watershed. **Resources:** The watershed recieved a high priority resource score with respect to tidal flats, and moderately high scores for salt marsh extent and shellfish habitat. **Priority:** Belle Isle Creek/ Winthrop Bay recieved a **C,B** score for resources and stressors, respectively, indicating a **moderately low management priority.**
18	**CHELSEA CREEK / MYSTIC RIVER / CHARLES RIVER / BOSTON INNER HARBOR**	**Stressors:** Chelsea Creek/ Mystic River/ Charles River received high priority scores for high intensity land use, stormwater runoff volume, population, and impervious area. It also received moderately high priority scores for 303(d) impairments for both bacteria and nutrients. **Resources:** The watershed recieved a high resource priority ranking for anadromous fish runs. It fell in the lowest quartile for its scores related to salt marsh extent, shellfish habitat, and shorebird habitat. **Priority:** Chelsea Creek/ Mystic River/ Charles River recieved a **C,D** score for resources and stressors, respectively, indicating a **moderate management priority**.

ID	NAME	DISCUSSION
19	**NEPONSET RIVER / DORCHESTER BAY**	**Stressors:** Neponset River/ Dorchester Bay received high priority scores for high intensity land use, stormwater runoff volume, population, and impervious area. It also received moderately high priority scores for 303(d) impairments for bacteria. **Resources:** The watershed recieved moderately high priority scores for tidal flat extent, shorebird nesting sites, and anadromous fish runs. **Priority:** Neponset River/ Dorchester Bay recieved a **B,D** score for resources and stressors, respectively, indicating a **high management priority.**
20	**BLACKS CREEK / QUINCY BAY**	**Stressors:** Blacks Creek/ Quincy Bay received high priority scores for high intensity land use, impervious area, and population. It also received high priority rankings for road crossings and road crossings within tidal areas. Wastewater sources and nutrient impairments of waterbodies were not high priority considerations for this watershed. **Resources:** The watershed recieved high priority resource rankings for shorebird nesting sites, and moderately high rankings for tidal flat extent and shellfish habitat. Seagrass is not an important resource for this watershed. **Priority:** Blacks Creek/ Quincy Bay recieved a **B,C** score for resources and stressors, respectively, indicating a **moderately high management priority.**
21	**BACK RIVER / FORE RIVER / HINGHAM BAY**	**Stressors:** Back River/ Fore River/ Hingham Bay ranked in the top quartile for the indicator categories of population and 303(d) impairments for bacteria. It received moderately high priority rankings for high intensity land use, stormwater runoff volume, and impervious area. **Resources:** The watershed scored highly for tidal flats, shorebird nesting sites, and anadromous fish runs. Other resource indicators ranked within the second lowest quartile. **Priority:** Back River/ Fore River/ Hingham Bay recieved an **A,C** score for resources and stressors, respectively, indicating a **high management priority**.
22	**WEIR RIVER / STRAITS POND**	**Stressors:** Weir River/ Straits Pond received high priority stressor scores for prohibited or restricted designated shellfish growing areas and for 303(d) impairments for bacteria. It also received moderately high rankings for impervious area, stormwater runoff volume, population, and crossings in tidal areas. **Resources:** The estuary ranked in the second highest quartile with respect to shellfish habitat, shorebird habitat, and anadromous fish runs. Seagrass extent and tidal flats were not high priority resources within this watershed. **Priority:** Weir River/ Straits Pond recieved a **C,D** score for resources and stressors, respectively, indicating a **moderately high management priority.**
23	**BOSTON HARBOR**	Boston Harbor includes Belle Isle Creek/ Winthrop Bay, Chelsea Creek/ Mystic River/ Charles River, Neponset River/ Dorcester Bay, Blacks Creek/ Quincy Bay, Back River/ Fore River/ Hingham Bay, and Weir River/ Straits Pond. **Stressors:** Boston Harbor received high priority rankings for high intensity land use, stormwater runoff volume, impervious area, and population. All designated shellfish growing areas for this watershed are prohibited or conditionally restricted. The watershed ranked in the highest quartile for number of impoundments leading to fish passage barriers. **Resources:** The watershed recieved a high priority ranking for anadromous fish runs, and ranked in the second highest quartile for tidal flats and shorebird nesting sites. **Priority:** Boston Harbor recieved a **B,D** score for resources and stressors, respectively, indicating a **high management priority.**
24	**LITTLE HARBOR**	**Stressors:** Little Harbor received a high priority ranking due to prohibited designated shellfish areas, as well as road crossings and crossings within tidal areas. High intensity land use, stormwater runoff volume, and population indicators were ranked moderately high for this watershed. **Resources:** Little Harbor ranked highly for tidal flat extent and shorebird habitat. It ranked within the second quartile with respect to salt marsh extent. Sea grass and anadromous fish runs were not high priority resources within the watershed. **Priority:** Little Harbor recieved a **B,C** score for resources and stressors, respectively, indicating a **moderately high management priority.**

ID	NAME	DISCUSSION
25	**COHASSET HARBOR**	**Stressors:** Cohasset Harbor received a high priority ranking for road crossings within tidal areas and moderately high rankings for high intensity land use, stormwater runoff volume, and population. 303(d) impairments of waterbodies for bacteria were also a high priority indicator, and 303(d) impairments of waterbodies for nutriends were ranked moderately high. Wastewater from septic systems ranked in the second highest quartile. **Resources:** Cohasset Harbor recieved high resource priority scores for tidal flats, seagrass extent, and nesting sites, and moderately high priority scores for salt marsh extent and anadromous fish runs. **Priority:** Cohasset Harbor recieved an **A,C** score for resources and stressors, respectively, indicating a **high management priority.**
26	**SCITUATE HARBOR**	**Stressors**: Scituate Harbor received a high priority ranking for road crossings within tidal areas and moderately high rankings for high intensity land use, stormwater runoff volume, impervious area, and population. 303(d) impairments of waterbodies for bacteria were also a high priority indicator. **Resources:** The watershed recieved moderately high priority rankings for salt marsh extent, sea grass extent, and tidal flat extent. Other resources recieved a low priority for this watershed. **Priority:** Scituate Harbor recieved a **C,C** score for resources and stressors, respectively, indicating a **moderate management priority.**
27	**NORTH RIVER / SOUTH RIVER**	**Stressors**: North and South River exhibited a high priority score with respect to septic system use, with an estimated wastewater flowrate from septic systems of 0.51 MGD. Other high priority indicators include 303(d) impairments for bacteria and impoundments that cause fish passage barriers. **Resources:** The watershed recieved high priority scores for salt marsh extent and anadromous fish runs. It also recieved moderately high priority scores for tidal flats, shellfish habitat, and shorebird habitat. **Priority:** North and South River recieved a **B,C** score for resources and stressors, respectively, indicating a **moderately high management priority.**
28	**GREEN HARBOR**	**Stressors:** Green Harbor River is ranked highly for stressors with respect to 303(d) impairments for nutrients in its streams. It also received moderately high ranking scores for high intensity land use, stormwater runoff volume, impervious area, and population. Wastewater discharges from septic systems were also ranked as moderately high priority stressors. **Resources:** The watershed recieved high priority scores for shorebird habitat, but other estuarine resources recieved low priority. **Priority:** Green Harbor River recieved a **D,B** score for resources and stressors, respectively, indicating a **low management priority.**
29	**BLUEFISH RIVER / BACK RIVER / DUXBURY BAY**	**Stressors:** Bluefish River/ Back River/ Duxbury Bay Complex received a high priority score for wastewater discharges from septic systems, with an estimated flowrate of 0.27 MGD. The majority of other stressor indicators ranked in the low or moderately low priority range. **Resources:** The watershed recieved high priority scores for the majority of the resource indicators, except for anadromous fish runs, for which it ranked in the moderately low priority range. **Priority:** Due to the high concentration of estuarine resources and the low presence of ecological stressors, Bluefish River/ Back River/ Duxbury Bay Complex recieved an **A,A** score for resources and stressors, respectively, indicating a **moderate management priority.**
30	**JONES RIVER / KINGSTON BAY**	**Stressors:** Jones River/ Kingston Bay Complex received high priority rankings for two wastewater sources; wastewater discharges to groundwater (0.91 MGD, the highest flowrate of this type of any watershed), and septic system use (0.43 MGD). 303(d) impairments for nutrients in streams was also a high priority stressor. **Resources:** The bay also recieved high priority scores for seagrass extent, shellfish habitat, shorebird habitat, and anadromous fish runs. **Priority:** Jones River/ Kingston Bay Complex recieved an **A,D** score for resources and stressors, respectively, indicating a **high management priority.**

ID	NAME	DISCUSSION
31	**EEL RIVER / PLYMOUTH HARBOR**	**Stressors:** Eel River/ Plymouth Harbor Complex had several high priority stressors, including prohibited designated shellfish areas, and 303(d) impairments for waterbodies for both nutrients and bacteria. Septic systems were also a high priority, with an estimated flowrate from septic systems of 0.36 MGD. **Resources:** The watershed recieved high priority resource scores for seagrass extent, shorebird habitat and nesting sites, and anadromous fish runs. Salt marsh and tidal flats were not a high priority resource for this watershed. **Priority:** Eel River/ Plymouth Harbor Complex recieved an **A,D** score for resources and stressors, respectively, indicating a **high management priority.**
32	**ELLISVILLE HARBOR**	**Stressors:** Ellisville Harbor received low priority scores for the majority of its stressor indicators, with each indicator falling in the lowest two quartiles. **Resources:** Ellsville harbor recieved low priority scores for the majority of resource indicators, with the exception of seagrass extent, which ranked in the second highest quantile. **Priority:** Ellisville Harbor recieved a **D,A** score for resources and stressors, respectively, indicating a **low management priority.**
33	**GREAT HERRING POND / BOURNEDALE**	**Stressors:** Great Herring Pond/ Bournedale received a high priority stressor score for wastewater discharges to groundwater, with an estimated flowrate of low priority scores for the majority of its stressor indicators, with each indicator falling in the lowest two quartiles. **Resources:** This watershed recieved low priority scores for the majority of resource indicators, with the exception of seagrass extent, which ranked in the second highest quantile. **Priority:** Ellisville Harbor recieved a **D,A** score for resources and stressors, respectively, indicating a **low management priority.**
34	**SANDWICH HARBOR**	**Stressors**: Sandwich harbor received a high priority ranking for wastewater from septic systems, and a moderately high priority ranking for 303(d) impairments to waterbodies for nutrients and impoundments that cause an impediment to fish passage. **Resources:** Salt marsh extent, shellfish habitat, and anadromous fish runs were ranked moderately high for their resource priority. **Priority:** Sandwich Harbor recieved a **C,A** score for resources and stressors, respectively, indicating a **low management priority.**
35	**SCORTON CREEK**	**Stressors:** Scorton Creek received a high priority ranking for wastewater from septic systems and 303(d) impairments to streams for bacteria and impoundments that cause an impediment to fish passage. **Resources:** This watershed received a moderately high priority ranking for salt marsh extent. **Priority:** Scorton Creek recieved an **D,B** score for resources and stressors, respectively, indicating a **low management priority.**
36	**BARNSTABLE HARBOR**	**Stressors:** Barnstable Harbor received a high priority ranking for wastewater from septic systems and 303(d) impairments to streams for bacteria and impoundments that cause an impediment to fish passage. **Resources:** Barnstable Harbor received high priority resource scores for a majority of resource indicators except for seagrass extent and shorebird nesting sites, which were not high priority resources for the watershed. **Priority:** Barnstable Harbor recieved an **A,A** score for resources and stressors, respectively, indicating a **moderate management priority.**
37	**CHASE GARDEN CREEK**	**Stressors**: Chase Garden Creek received a high priority ranking for wastewater discharges to groundwater and wastewater discharges from septic systems. 303(d) impairments to streams for bacteria were also a high priority stressor for this watershed. **Resources:** This watershed ranked in the top quartile for salt marsh extent and shorebird habitat, and the second highest quartile for tidal flat extent. **Priority:** Chase Garden Creek recieved a **C,C** score for resources and stressors, respectively, indicating a **moderate management priority.**

ID	NAME	DISCUSSION
38	**SESUIT CREEK / SESUIT HARBOR**	**Stressors:** Road crossings, as well as road crossings within tidal areas, are a high priority indicator for Sesuit Creek Harbor. High intensity land use, impervious area, and wastewater from septic systems were indicators with a moderately high priority score. **Resources:** Sesuit Creek/Harbor recieved a low ranking for resources, with all of its resource indicators scored in the lowest two quartiles. **Priority:** Sesuit Creek/Harbor recieved a **D,B** score for resources and stressors, respectively, indicating a **low management priority.**
39	**QUIVETT CREEK**	**Stressors:** Quivet Creek received high priority rankings or 303(d) impairments to waterbodies and streams for bacteria. Most other stressors were low priority in this watershed. **Resources:** Salt marsh extent and seagrass extent were high priority resources within this watershed. **Priority:** Quivet Creek recieved a **C,A** score for resources and stressors, respectively, indicating a **low management priority.**
40	**PAINE'S CREEK / STONY BROOK**	**Stressors:** Panes Creek/ Stony Brook received high priority rankings for 303(d) impairments to waterbodies for nutrients, as well as for road crossings located in tidal areas. Wastewater discharges to groundwater and wastewater from septic systems were also moderately high priority stressors in this watershed. **Resources:** Anadromous fish runs were ranked in the second highest quartile. Other resource indicators did not exhibit a high priority. **Priority:** Panes Creek/ Stony Brook recieved a **D,B** score for resources and stressors, respectively, indicating a **low management priority.**
41	**NAMSKAKET CREEK / LITTLE NAMSKAKET CREEK**	**Stressors:** Namskaket/ Little Namskaket received high priority rankings for 303(d) impairments to streams for bacteria. Wastewater discharge to groundwater was also a high priority stressors in this watershed. **Resources:** Salt marsh extent was ranked moderately high for this watershed. Other resource indicators were ranked low to moderately low. **Priority:** Namskaket/ Little Namskaket recieved a **D,A** score for resources and stressors, respectively, indicating a **low management priority.**
42	**BOAT MEADOW CREEK / ROCK HARBOR**	**Stressors:** Rock Harbor received high priority rankings for 303(d) impairments to waterbodies and streams for bacteria. Road crossings in tidal areas were also a high priority stressor indicator in this watershed. **Resources:** This watershed received high priority rankings for salt marsh extent and shellfish habitat. **Priority:** Namskaket/ Little Namskaket recieved a **B,B** score for resources and stressors, respectively, indicating a **moderate management priority.**
43	**HERRING RIVER / HERRING POND**	**Stressors:** Stressor indicators for Herring River/ Herring Pond ranked in the lowest quartiles, resulting in stressor indicators being a low priority for this watershed. **Resources:** Salt marsh extent, tidal flat extent, and shellfish habitat were all high priority resources. **Priority:** Herring River/ Herring Pond recieved a **B,A** score for resources and stressors, respectively, indicating a **moderately low management priority.**
44	**HERRING BROOK / GREAT POND**	**Stressors:** Herring Brook/ Great Pond received a high priority ranking for 303(d) impairments to waterbodies for nutrients. Road crossings and crossings within tidal areas area lso high priority stressors for this watershed. **Resources:** Resource indicators in this watershed were not a high priority management concern, with most indicators falling in the lowest quartile. **Priority:** Herring River/ Herring Pond recieved a **D,B** score for resources and stressors, respectively, indicating a **low management priority.**

ID	NAME	DISCUSSION
45	**WELLFLEET HARBOR**	**Stressors:** Wellfleet Harbor received moderately high priority rankings for wastewater discharges to groundwater, septic system use, and 303(d) impairments to waterbodies for bacteria. The majority of other indicators of ecological stress were of low priority. **Resources:** Tidal flats and shellfish habitat were high priority resources for the watershed, while salt marsh extent, shellfish habitat, and anadromous fish runs were moderately high resource priorities. **Priority**: Wellfleet Harbor recieved an **A,A** score for resources and stressors, respectively, indicating **moderate management priority.**
46	**PAMET RIVER / LITTLE PAMET RIVER**	**Stressors**: Pamet River/ Little Pamet River Complex exhibited low priority for the majority of ecological stressor indicators, with the exception of 303(d) impairments to waterbodies for bacteria, which was a high priority indicator for the watershed. **Resources:** Salt marsh extent, shellfish habitat, and anadromous fish runs recieved moderately high priority ranking scores. **Priority:** Pamet River/ Little Pamet River Complex recieved a **C,A** score for resources and stressors, respectively, indicating **low management priority.**
47	**PROVINCETOWN HARBOR**	**Stressors:** Wastewater discharges to groundwater presented a high stressor priority for Provincetown Harbor, while the stressors of septic system use and 303(d) impairments for bacteria were both ranked moderately high. **Resources:** Tidal flat extent and seagrass are both high priority resources within the estuary. **Priority:** Provincetown Harbor recieved a **B,A** score for resources and stressors, respectively, indicating a **moderately low management priority.**