

WATERSHED ANALYSIS OF THE MYSTIC RIVER AND NEPONSET RIVER WATERSHEDS

TASK 3C TECHNICAL REPORT MYSTIC RIVER WATERSHED PROPERTY PARCEL ANALYSES

NOVEMBER 13, 2023

Prepared for:

U.S. EPA Region 1



Prepared by:

Paradigm Environmental



Great Lakes Environmental Center



Blanket Purchase Agreement: BPA-68HE0118A0001-0003
Requisition Number: PR-OA-22-00343
Order: 68HE0123F0002

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1 INTRODUCTION

The highly developed Mystic River Watershed drains into Boston Harbor and faces multiple water quality impairments primarily from nutrients (phosphorus and nitrogen) and pathogens from human activity and urban development. These impairments are evidenced by algal blooms and macrophyte growth which contribute to anoxic bottom waters that do not support aquatic life, reduce water clarity, degrade the aesthetic quality of the river, and impair designated uses such as fishing and boating. The Mystic River Alternative TMDL was published in January 2020 and provides an adaptive approach to manage phosphorus nutrient pollution to improve water quality and attain water quality standards (USEPA, 2020). The alternative TMDL identifies stormwater runoff as the main source of nutrient loads within the watershed and calculated that, under existing conditions, a 62-67% reduction of stormwater total phosphorus (TP) loadings is required. On August 24, 2020, the U.S. Environmental Protection Agency (EPA) received a residual designation petition from the Conservation Law Foundation for the Mystic River Watershed. The petition requests that EPA permit stormwater from commercial, industrial, institutional, and multi-family residential (CIIM) properties of one acre or greater under the National Pollutant Discharge Elimination System (NPDES) program to meet water quality standards (WQS) in Boston Harbor.

This report presents a methodology to develop, and analyses of, parcel-level stormwater TP and total nitrogen (TN) loading within the Mystic River Watershed that may be used by EPA Region 1 to support decision making regarding the residual designation petition. Within the context of the Alternative TMDL process, this report makes use of updated stormwater runoff and pollutant loading developed for the Mystic River Watershed (Paradigm Environmental, 2023). These values form the basis against which parcel-level stormwater management strategies can be evaluated. A 62% reduction in stormwater total phosphorus loads was used in this analysis to represent the estimated load reduction required under baseline conditions (USEPA 2020). Key information presented in this report includes an analysis of CIIM parcels, their characteristics such as the amount of impervious cover (IC), and their estimated stormwater nutrient loads. IC is the largest source of stormwater runoff within the watershed and findings from an analysis of the relationship between the number of CIIM parcels, IC area, and TP load are presented to demonstrate potential strategies regulating the fewest number of parcels while achieving the largest possible pollutant reduction benefits. The results of this report can be further refined using other considerations, such as where and how communities facing environmental justice (EJ) concerns may be impacted, and apportioned into each municipality within the watershed where, ultimately, progress can be made towards meeting the Alternative TMDL.

2 METHODOLOGY

The general methodology presented here follows the process used in the Charles River Watershed (CRW) Total Phosphorous analysis (U.S. EPA, 2022a Appendix 4, 2022b). Key steps, refinements, and quality assurance checks are detailed in the following subsections.

2.1 Data Inventory

Readily available data necessary for parcel analysis were collected, reviewed, and assessed. Data were obtained from online repositories as well as from EPA staff. Table 2-1 provides an inventory of the GIS data collected and indicates the use of that dataset.

Table 2-1. Data used in the parcel analysis

Name	Use	Source	Source Link	Source Date
2016 Land use and land cover	IC calculation	MassGIS	https://www.mass.gov/info-details/massgis-data-2016-land-coverland-use	May 2019
Hydrologic Response Units (HRUs)	Loading rate and load calculations	Task 3A and 3B (Paradigm Environmental, 2023)		
Parcel boundaries	For summary results	MassGIS	https://www.mass.gov/info-details/massgis-data-property-tax-parcels	Feb 2023
L3 Tax Assessor Table	Parcel details	MassGIS		Feb 2023
Municipal boundaries	For summary results	MassGIS	https://www.mass.gov/info-details/massgis-data-municipalities	April 2022
Mystic River Watershed	For summary results	MassGIS	https://www.mass.gov/info-details/massgis-data-major-watersheds	June 2000
Subwatershed boundaries	For summary results	EPA	Alternative TMDL Admin Record	
Municipal separate storm sewer system (MS4) boundaries	For summary results	EPA	Alternative TMDL Admin Record	
Combined Sewer System (CSS) Drainage	For summary results	EPA	Alternative TMDL Admin Record	

2.2 Parcel Analysis

Parcel analysis includes two main components: 1) GIS-based spatial analysis and 2) summary analysis using a python-based tool. These steps are described below and were formulated to be as accurate, transparent, and reproducible as feasible. The parcel analysis workflow, required inputs, and outputs is shown in Figure 2-1. Results of the parcel analysis are summary attributes for each parcel, as shown in Table 2-2, and additional summaries aggregating the parcel data with other conditions and spatial scales as detailed in Section 3.

Table 2-2. Parcel-level summary attributes calculated

Attribute	Description
Loc_ID	Unique parcel ID
Parcel Type	Tax classification (e.g., TAX, FEE, ROW, WATER)
Municipality Name	City or Town name
Owner	Property owner's name
Owner Address	Property owner's address
Owner City	Property owner's city
Owner Country	Property owner's country
Owner State	Property owner's state
Owner Zip Code	Property owner's zip code
Lot Size (ac)	Deed area (converted to acres in this analysis)
Site Address	Site address
Site Zip Code	Site address zip code
Units	Number of units on the property
Year Built	Year building was built
Public/Private	Owner type (public or private) based on filtering described in Section 2.3.1
FY	Year of data
MS4 (boolean, 1 = within MS4)	Inside or outside of the MS4 area
CSA (boolean, 1 = within CSA)	Inside or outside of the Combined Sewer Area (CSA)
Subbasin	Subbasin name(s) and percentages if multiple
Area in Major Basin (%)	Percentage of parcel area with the watershed
Use Code	Use code from Tax Assessor
L3 Use Description	Use description from Tax Assessor
Dept. Revenue Description	Use description from MA Dept. of Revenue (from Use Code)
Parcel Use Group	Land use classification in the current analysis (from Use Code)
MassGIS Land Use	Land use from MassGIS 2016 LULC
Total Area (ac)	Parcel area calculated in the current analysis
IC Area (ac)	The impervious cover area from the 2016 data
IC Percent	Percent impervious cover calculated from MassGIS 2016 LULC
Wetland Area (ac)	Wetland area on the parcel
Wetland Percent	Wetland percent on the parcel
Water Area (ac)	Water area on the parcel
Water Percent	Water percent on the parcel
Forest Area (ac)	Forest area on the parcel
Forest Percent	Forest percentage on the parcel
Pervious Area (ac)	Pervious area
Pervious Percent	Percent pervious

Attribute	Description
Total Pervious Load (lb/yr)	TP and TN load from the parcel's pervious cover
IC Load (lb/yr)	TP and TN load from the parcel's impervious cover
Total parcel load (lb/yr)	Total TP and TN load from parcel

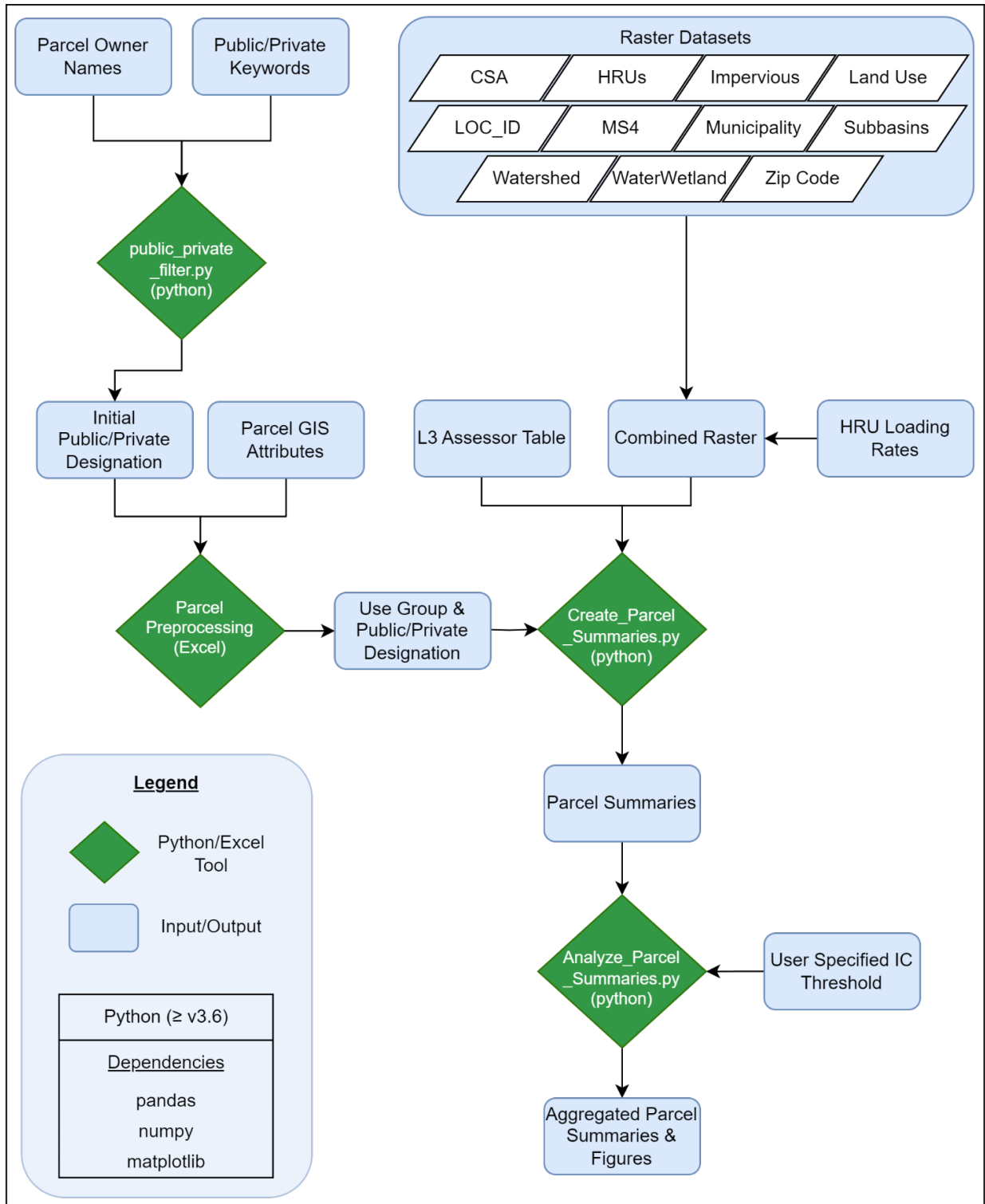


Figure 2-1. Parcel analysis workflow, including relevant requirements, inputs, and outputs.

2.2.1 GIS-based Spatial Analysis

The GIS-based processing is raster-based and assembles the required data for parcel-level analysis and summaries at other spatial scales. The output of this step is a combined raster layer and attribute table listing the unique combinations of all input rasters. The major GIS processing steps are:

1. Ensure all layers use the same projection (EPSG: 26986, Massachusetts State Plane Coordinate System, Mainland Zone).
2. Clip all layers to the area of interest (Mystic River Watershed boundary including below the Amelia Earhart Dam).
3. Convert all polygon layers to rasters with 1-square meter cells (e.g., parcel layer). The raster cell values will be a unique identifier (e.g., *LOC_ID* for parcels) to allow the joining of attributes in later steps.
4. Overlay all rasters using the ESRI Combine tool. The output is a combined raster and an attribute table with a unique identifier for each unique combination of input raster values.

The combined raster attribute table is converted into an Excel spreadsheet and the pollutant load calculated based on the HRU by multiplying the area of each unique combination by the appropriate loading rate. The development of loading rates is described in the Task 3A-B memo (Paradigm Environmental, 2023).

Parcel Preprocessing

One additional processing step was performed on the tax parcel polygon layer to create a second input to the python-based processing described below. Namely, once all the parcels were clipped to the Mystic River Watershed, all the unique “Use_Codes” were mapped to a single use group similar to those used in the CRW TP analysis (Table 2-3). This allows users to easily update parcel classifications as additional parcel details or corrections become available, without having to modify the python code. The Use Codes are generally, but not always, standardized codes set by the MA Department of Revenue and provide a greater number of categories than the 2016 LULC dataset (MA Dept. of Revenue Division of Local Services, 2016). For example, the CRW TP analysis grouped several Code 9 Use Code values into institutional groups; these categories do not exist in the MassGIS 2016 LULC dataset but are important for evaluating loading from CIIM parcels. As well as using the CRW Use Code groups, a right-of-way group and water group were added as the current analysis considers all parcels within the Mystic River Watershed. A public or private designation was assigned to each parcel during this preprocessing step (detailed in Section 2.3.1).

Table 2-3. Use Groups assigned in the CRW and Mystic analyses

CRW Use Group	Mystic Use Groups	Public/Private
Agriculture	Agriculture	Private
Commercial	Commercial	Public or Private
Industrial	Industrial	Public or Private
Open Land	Open Land	Public or Private
Local Institutional	Local Institutional	Public
Private Institutional	Private Institutional	Private
State Institutional	State Institutional	Public
MultiFamily Residential	MultiFamily Residential	Public or Private
Single Family Residential	Single Family Residential	Public or Private
Federal Institutional	Federal Institutional	Public
Two Family Residential	MultiFamily Residential	Public or Private
Three Family Residential	MultiFamily Residential	Public or Private

CRW Use Group	Mystic Use Groups	Public/Private
MultiFamily Residential (4-8)	MultiFamily Residential	Public or Private
MultiFamily Residential (>8)	MultiFamily Residential	Public or Private
	Right-of-Way	Public or Private
	Water	Public or Private

The main steps in parcel Use Group classification are listed below. In general, each step reclassifies unknowns from the preceding steps.

1. Assign from Use Code based on existing CRW classification
2. Assign institutional categories from Use Code 9 parcels unique to the Mystic River Watershed
3. Assign “Unknown” if no Use Code and no Owner
4. Assign Multi-Use (Table 2-4)
5. Assign from major Use Code category (first digit, Table 2-5)
6. Assign from PolyType (only Right-of-Way and Water)
7. Remaining Unknowns classified from the dominant MassGIS 2016 LULC category.
8. Manually reclassify select parcels (Table 2-6).

Appendix A lists all the unique Use Codes, Use Groups, and Public/Private categories within the watershed; all preprocessing steps are detailed in the accompanying excel file (AppendixA_TaxParcel_PreprocessingWorkbook.xlsx).

Table 2-4. Reclassification table for Multi-Use parcels

2 Digit Use Code	Use Group
01	MultiFamily Residential
03	Commercial
04	Industrial
06	Open Land
07	Open Land
08	Open Land
09	Private Institutional

Table 2-5. Reclassification table for major Use Code category

1 Digit Use Code	Use Group
1	MultiFamily Residential
2	Open Land
3	Commercial
4	Industrial
5	Unknown
6	Open Land
7	Open Land
8	Open Land
9	Private Institutional

Table 2-6. Parcels with manually classified Use Group and Public/Private designation

LOC_ID	Description	Use Group	Public/Private
F_770333_2987156	Middlesex Fells Reservation	Open Space	Public
F_768714_2985977	Middlesex Fells Reservation	Open Space	Public
F_766743_2986806	Middlesex Fells Reservation	Open Space	Public
F_765447_2986826	Middlesex Fells Reservation	Open Space	Public
F_763814_2986577	Middlesex Fells Reservation	Open Space	Public
F_767789_2988784	Middlesex Fells Reservation	Open Space	Public
F_767813_2991257	Middlesex Fells Reservation	Open Space	Public
F_767442_2994000	Middlesex Fells Reservation	Open Space	Public
F_764946_2991447	Middlesex Fells Reservation	Water	Public
F_763342_2994579	Middlesex Fells Reservation	Open Space	Public
F_761427_2992265	Middlesex Fells Reservation	Open Space	Public
F_758519_2991593	Middlesex Fells Reservation	Open Space	Public
F_760509_2986385	Middlesex Fells Reservation	Open Space	Public
F_757393_2983949	Middlesex Fells Reservation	Open Space	Public
F_757832_2980766	Middlesex Fells Reservation	Open Space	Public
F_792840_2955777	Boston Logan Int. Airport	Commercial	Private
M_240825_902405	Boston Logan Int. Airport	Commercial	Private
F_786173_2955267	Boston Logan Int. Airport	Commercial	Private
F_784991_2964389	Sliver. See Appendix A.	Single Family Residential	Private
M_243599_904367	See Appendix A.	Public Institutional	Public
F_764036_2995486	See Appendix A.	MultiFamily Residential	Private
F_765576_3007707	See Appendix A.	Single Family Residential	Private

Results of the parcel preprocessing, in terms of total distribution within the Mystic River Watershed, are shown in Figure 2-2 and mapped in Figure 2-3. This analysis shows that more than one-quarter (26.1%) of the watershed area is made up of single-family residences and combined multi-family residences make up 13%. Public institutional groups (local, state, and federal) make up 13% of the watershed area with private institutional totaling just 2.1%. In total, commercial, industrial, and private institutional constitute 18.6% of the watershed area. The distribution of public/private parcels, grouped by Use Code group, is shown in Table 2-7. In total, the current classification has 36.9% public parcels and 63.1% private; non-right-of-way public parcels account for 21.3% of parcel area.

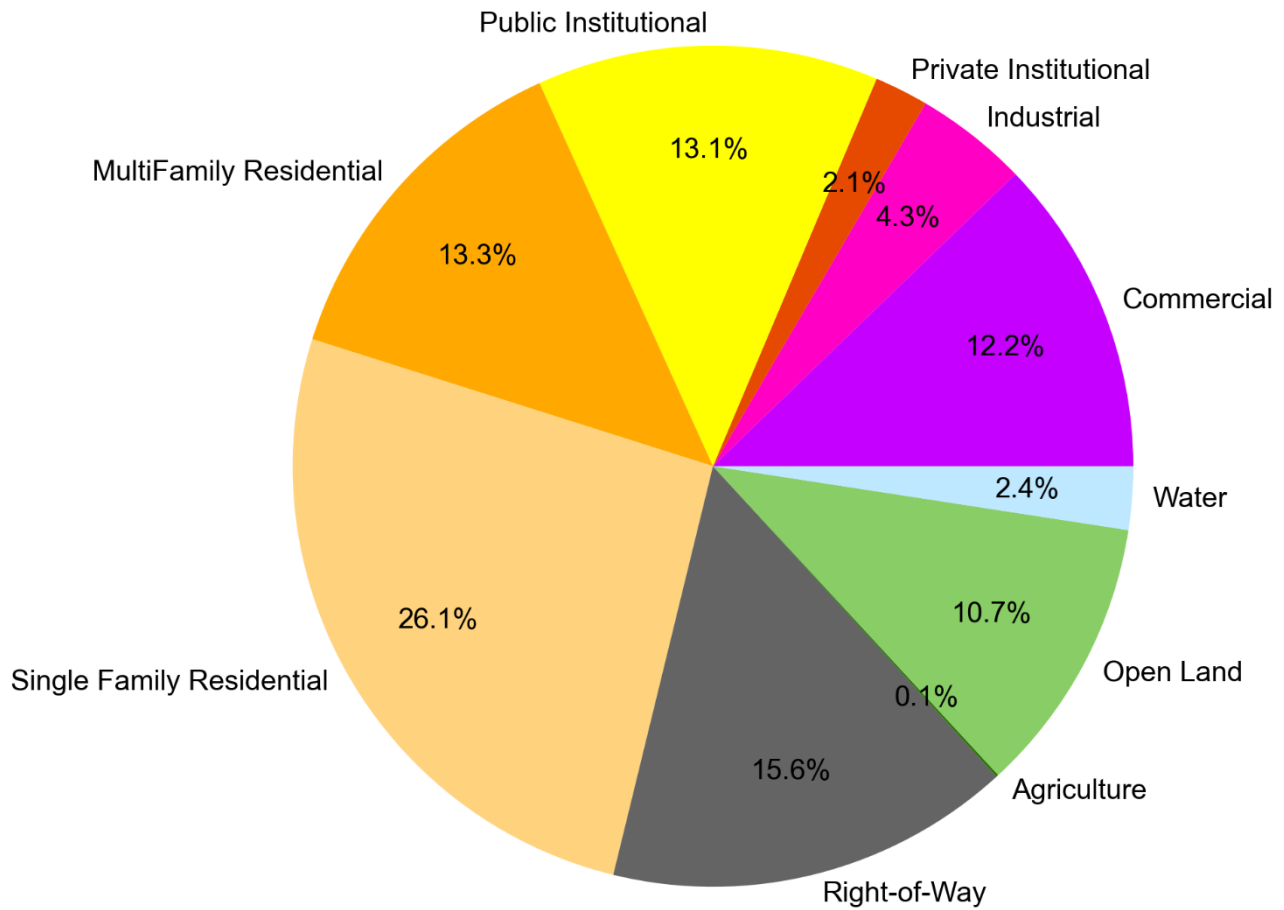


Figure 2-2. Distribution of parcel area by Use Group within the Mystic River Watershed.

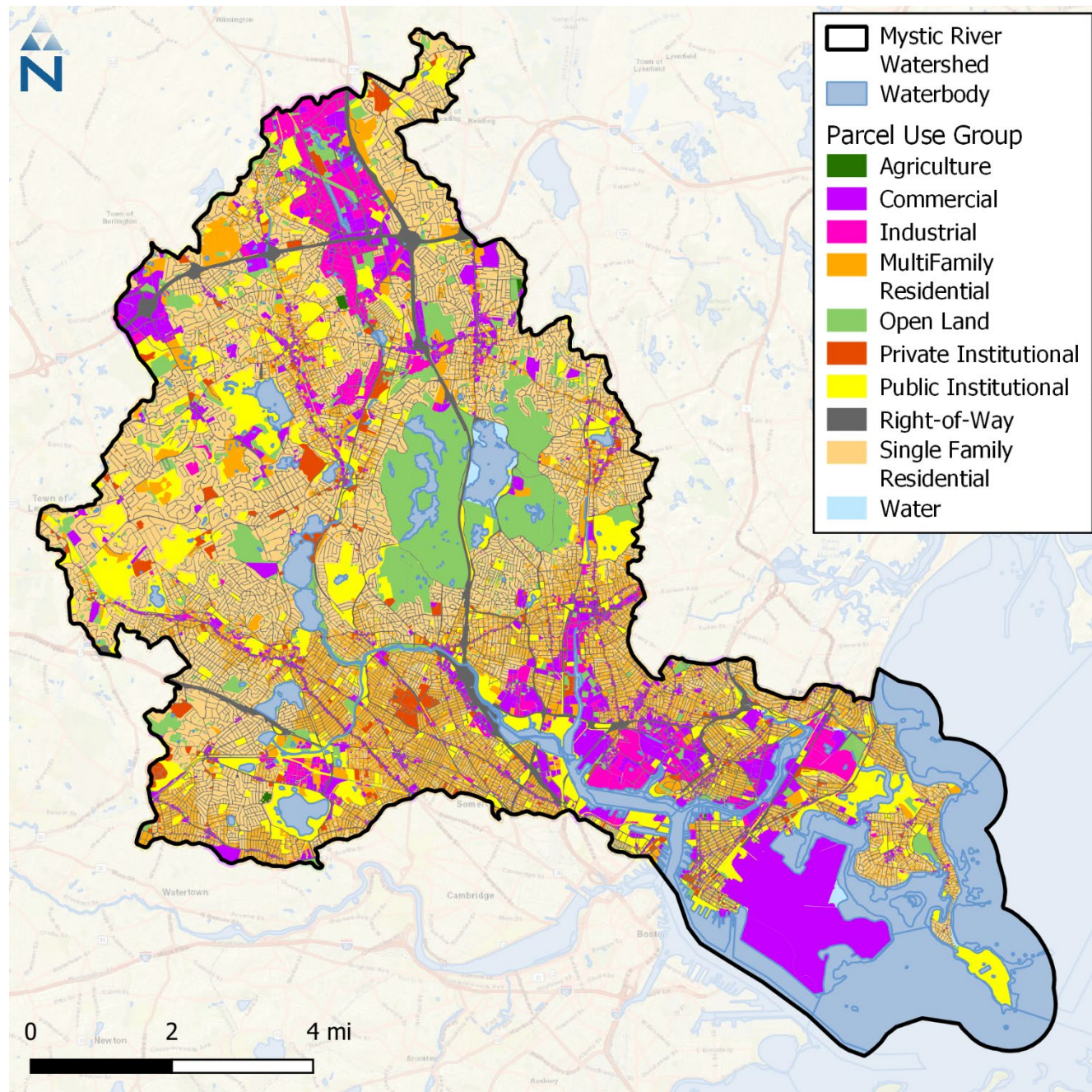


Figure 2-3. Map of parcel Use Groups within the Mystic River Watershed. Note that the resolution of this map is parcel-scale; waterbodies exist within non-Water class parcels and have been added to aid visualization.

Table 2-7. Distribution of public and private parcel areas by Use Group

Public/Private	Use Group	Count	Count (%)	Total Area (ac)	Total Area (%)
Private	Agriculture	33	0.03	43.61	0.09
	Commercial	5,167	4.35	6,134.53	12.20
	Industrial	839	0.71	2,182.61	4.34
	MultiFamily Residential	41,626	35.07	6,707.92	13.34
	Open Land	5,196	4.38	2,504.80	4.98
	Private Institutional	909	0.77	1,042.92	2.07
	Right-of-Way	60	0.05	22.15	0.04
	Single Family Residential	61,671	51.96	13,107.76	26.07
	Water	0	0.00	0.00	0.00
	Subtotal	115,501	97.3	31,746.29	63.1
Public	Agriculture	0	0.00	0.00	0.00
	Commercial	4	0.00	6.38	0.01
	Industrial	5	0.00	2.23	0.00
	MultiFamily Residential	0	0.00	0.00	0.00
	Open Land	194	0.16	2,873.67	5.72
	Public Institutional	2,608	2.20	6,606.03	13.14
	Right-of-Way	320	0.27	7,819.71	15.55
	Single Family Residential	0	0.00	0.00	0.00
	Water	65	0.05	1,221.62	2.43
	Subtotal	3,196	2.7	18,529.64	36.9
Total	118,697	100	50,275.94	100	

2.2.2 Python-Based Summary Analysis

The raster attribute table output from GIS processing was further processed using a tool developed in python (Figure 2-1). Python is a commonly used programming language for data management and analysis due to its ease of use and readability; all python software and packages used in this analysis are freely available and open source. The output of this processing is an Excel compatible spreadsheet file including every parcel and additional summaries based on aggregating the data with different conditions and spatial scales. The major python processing steps include:

1. Read the combined raster attribute table into a data frame using the pandas python package.
 - This is a powerful data structure that allows for a wide variety of data manipulation and evaluation.
 - Efficient for large-size datasets.
2. Join relevant attribute tables.
 - The parcel *LOC_ID* is used to join parcels with the preprocessed parcel data and the L3 Assessors Table, which provides parcel details such as site address, owner information, and year built.
 - Performing this step outside of a GIS environment should reduce processing time and potential data overlap errors.
3. Calculate parcel-level information.
 - The information shown in Table 2-2 is calculated for each parcel.
4. Generate parcel-level summary tables.
 - A summary spreadsheet file is generated and saved. The file includes all necessary information as shown in Table 2-2 for each property parcel.
 - The code can also optionally generate a summary table for multiple attributes (e.g., the unique intersection of parcel, municipality, and subbasin). This is useful for additional QA of area and loads.
5. Generate additional summaries.
 - Additional summaries of the calculated parcel data are created by aggregating with other conditions and spatial scales.
 - For example, TP loading from IC areas can be summarized for parcels of varying IC areas and Use Groups.

Outputs of the python-based processing are presented and evaluated in the Results and Discussion section. All input data, processing codes, and outputs will be made available to EPA; outputs can be visualized by joining with the *LOC_ID* in the parcel polygon layer.

2.3 Refinements from CRW Analysis

Parcel analysis for the Mystic River Watershed is based on the general methodology used in the Charles River Watershed. Several refinements were made to improve transparency and consistency including:

1. High-resolution (i.e., 1 squared meter cell size) raster-based GIS data processing
2. A consistent source of land use classification (MassGIS 2016 LULC)
3. Binary public or private designation at parcel-scale
4. The long-term annual average loading rates from the Opti-Tool HRU time series (for a period of 2007-2016)
5. The pollutant loading from the pervious areas is based on the HSG classification, providing additional resolution for load calculation.

The GIS processing performed in the CRW TP analysis was based primarily on polygon datasets, which can lead to errors or require additional processing with polygons being duplicated and/or overlapped. For the Mystic River analysis, the raster-based approach (Section 2.2.1) spatially aligns all datasets to eliminate errors such as polygon slivers or overlap of multi-part polygons.

The impervious cover is based on a rasterized version of the MassGIS 2016 LULC dataset, which contains the most recent and detailed IC data currently available. The land cover information in this layer is consistent with the Coastal Change Analysis Program (C-CAP)'s high-resolution land cover classification scheme and the entire LULC layer has been thoroughly vetted and documented by MassGIS (MassGIS, 2016). The CRW analysis used both a MassGIS 2005 IC raster and the 2016 LULC polygon dataset and stated that the 2005 IC raster was overly simplified. However, the 2016 land cover classifications are based on 1-meter aerial imagery and can be converted back to a 1-meter raster with essentially no loss in accuracy. This was evaluated for the Mystic River Watershed and shown in Table 2-8. Additionally, loading rates were calculated from the Opti-Tool Hydrologic Response Units (HRUs) that are primarily based on the MassGIS 2016 LULC dataset and average annual SW HRU pollutant load export rates that were developed in subtasks 3A and 3B (Paradigm Environmental, 2023).

Table 2-8. Comparison of IC cover in polygon and raster versions of the MassGIS 2016 LULC dataset for the Mystic River Watershed

MassGIS 2016 LULC	IC Area (ac)	Difference (%)
1-meter raster	23,217.3	0.005%
Polygon	23,216.2	

2.3.1 Public/Private Classification

For the Mystic River Watershed, a binary public/private classification based on similar Use Codes as those used in the CRW analysis was developed. The public/private designation uses keyword filters on the "OWNER1" attribute as an initial designation which is then further refined by looking at the assigned Use Group (Table 2-3). For example, any local, state, or federal institutional groups that were not classified as public in the keyword filtering were changed to public. These keywords are listed in Table 2-9 and were selected by visual inspection of unique code 9 owner names remaining after filtering out CRW use codes for local, state, and federal institutional groups. Binary classification is important to help distinguish between parcels already subject to regulation.

The main steps in creating the public/private designation are:

1. Owner keyword filtering (performed in python script)
2. Update RoW based on parcel PolyType
3. Classify parcels with a "Water" Use Group as public
 - a. These parcels are predominately water and account for only 0.1% of the total TP and TN loads (Table 3-2)
4. Classify unknowns based on Use Group
5. Update Residential
 - a. If residential and not Use code 9XX: private
6. Manual reclassification of selected parcels

Table 2-9. OWNER1 keywords for initial public/private parcel filtering

Public Keywords		
CITY OF	MASS BAY TRANS AUTHORITY	MASSACHUSETTS COMM OF METRO DIST COMM
COMM OF MASS	MASS BAY TRANS, AUTHORITY	MASSACHUSETTS COMMON OF
COMMNLTH OF MASS	MASS BAY TRANS. AUTH	MASSACHUSETTS COMMONWEALTH
COMMONWEALTH OF	MASS BAY TRANS. AUTHORITY	MASSACHUSETTS COMMONWEALTH OF
COMMWLTH OF MASS	MASS BAY TRANSP AUTH	MASSACHUSETTS DEPARTMENT
COMWLTH OF MASS	MASS BAY TRANSPORT AUTH	MASSACHUSETTS GOVT LAND BANK
COUNTY OF	MASS BAY TRANSPORTATION	MASSACHUSETTS PORT AUTH
DCR	MASS BAY TRANSPORTATION AUTH	MASSACHUSETTS PORT AUTHORITY
DEPARTMENT OF	MASS BAY TRANSPTN AUTHOR	MASSACHUSETTS TURNPIKE AUTHORITY
DEPT OF	MASS DOT	MBTA
DEPT. OF	MASS ELECTRIC CO	POST OFFICE
FIRE + POLICE BUILDING	MASS PORT AUTHORITY	REDEVELOPMENT ASSOC
FIRE DEPARTMENT	MASS TURNPIKE AUTHORITY	REDEVELOPMENT AUTH
HOUSING AUTH	MASS WATER RESOURCE AUTH	TOWN OF
LIBRARY	MASSACHUSETT PORT AUTHORITY	TOWN OFFICE BUILDING
M B T A	MASSACHUSETTS BAY TRANS AUTH	U S POST OFFICE
MASS BAY AUTHORITY	MASSACHUSETTS BAY TRANSIT AUTHORITY	UNITED STATES OF AMERICA
MASS BAY TRAN AUTHORITY	MASSACHUSETTS BAY TRANSIT AUTHORITY	UNITED STATES POSTAL SERVICE
MASS BAY TRANS AUTH	MASSACHUSETTS COMM OF	UNITED STATES PROPERTY
Private Keywords		
COMPANY	CONDO	LLC
TRUST	TRS	CREDIT UNION
REALTY	RLTY	INC
INCORPORATED		

2.4 Quality Assurance / Quality Control (QA/QC)

Several QA/QC steps have been performed to ensure the highest level of accuracy feasible. The greatest source of uncertainty in this analysis is the parcel attributes from the L3 Tax Assessor table. As seen in Table 2-9, owner names and other details are not standardized and may have typos that make automated processing difficult. To address this, parcels that remain unclassified as public/private after the processing described in Section 2.3.1 were manually examined and updated.

Additional checks include:

- Ensuring parcels have a single MassGIS 2016 land use category by intersecting parcel boundaries and reclassified land use categories.
- Evaluating the fraction of public and private ownership for feasibility
- Checking the sum of all parcel areas within a municipality equals the sum of municipality area and similar checks for other boundaries such as sub-watersheds.

2.5 Limitations

One limitation of this analysis is that parcels crossing the boundary of the Mystic River Watershed will only be evaluated for the portion of their area within the watershed. This is not expected to impact the calculation of load within the watershed, but will impact the calculation of area for different land uses at the parcel scale. For example, a parcel may have IC outside of the watershed boundary, but only the IC area and load within the watershed will be accounted for. The percentage of IC area will be calculated as the IC area within the watershed divided by the total parcel area within the watershed. The impact of splitting parcels on the watershed boundary should be negligible given that this is a small portion of the total number of parcels.

3 RESULTS AND DISCUSSION

This section describes the calculated TP and TN loads from private and public properties based on the parcel Use Group. Analyses include the proportional impact of different private property classes, the proportional impact of different property sizes based on the amount of impervious cover on each property, and a range of the optimal IC size thresholds to reduce the greatest amount of TN and TP while potentially regulating the fewest number of properties. Results within this section exclude any parcels within combined sewer system areas. This excluded 9,887 parcels (8.3% of all parcels) and 2,041.22 ac (4.1% of all parcel area). It was assumed that stormwater from these parcels was already treated.

The Mystic River Watershed Alternative TMDL (USEPA, 2020) uses the period 2007-2016 for the calculation of baseline annual average TP loads. Total baseline nutrient loads used in this parcel analysis are from the same time period and represent unattenuated stormwater TP loads of 40,660 lb/yr (Table 3-1). A watershed-wide 62% required reduction in TP load (25,209 lb/yr), as specified in the Alternative TMDL, was calculated from the baseline load. Note that there is 1,254 ac of parcel area outside of any municipality (denoted as “No Data” in Table 3-1). TP load from these areas is 0.2% of the watershed total but was not assigned to any municipality; this corresponds to the approach for calculating municipality loading used in the loading analysis (Paradigm Environmental, 2023).

Table 3-1. Stormwater annual average TP load (2007-2016) for municipalities within the Mystic River Watershed, excluding combined sewer system areas

Municipality	Annual Average (2007-2016) TP Load (lb/yr)			
	Public (%)	Private (%)	Unattenuated	Required Reduction
ARLINGTON	31%	69%	2,905.52	1,801.42
BELMONT	31%	69%	1,955.44	1,212.37
BOSTON ¹	27%	73%	4,599.85	2,851.91
BURLINGTON	25%	75%	971.95	602.61
CAMBRIDGE	27%	73%	999.26	619.54
CHELSEA ¹	27%	73%	2,003.49	1,242.16
EVERETT	15%	85%	2,602.57	1,613.59
LEXINGTON	34%	66%	954.38	591.72
MALDEN	27%	73%	2,192.65	1,359.44
MEDFORD	35%	65%	4,640.40	2,877.05
MELROSE	31%	69%	1,511.82	937.33
READING	38%	62%	853.70	529.29
REVERE ¹	27%	73%	1,318.11	817.23
SOMERVILLE	3%	97%	324.16	200.98
STONEHAM	33%	67%	2,421.79	1,501.51
WAKEFIELD	28%	72%	128.71	79.80
WATERTOWN	18%	82%	253.19	156.98
WILMINGTON	10%	90%	267.09	165.60
WINCHESTER	32%	68%	2,415.24	1,497.45
WINTHROP ¹	23%	77%	1,358.67	842.37
WOBURN	25%	75%	5,887.12	3,650.01
No Data ²	32%	68%	95.19	59.02
Total			40,660.29	25,209.38

¹These municipalities have area below the Earhart Dam and did not have instream attenuation factors developed in the Alternative TMDL.

²Note that there are 1,254 ac of parcel area within the Mystic River Watershed that are not covered by a municipal boundary. These areas represent 0.2% of the total TP load.

3.1 All Parcels

After excluding parcels within combined sewer areas, a total of 108,810 parcels remained for further analysis. The parcels are predominately Multifamily and Single Family Residential, which represent 87% of all parcels by count and 40% by land area. Other major parcel types include private commercial, public institutional, and public right-of-way. Open land makes up 11% of the parcel area and is approximately evenly split between public and private.

Figure 3-1 illustrates the distribution of summary attributes by Public/Private designation for all parcels in the Mystic River Watershed. Private parcels account for 97% of parcels and 63% of total parcel area. Forty-three percent of total parcel area is impervious cover, with private parcels having more than twice as much total IC area as public parcels (67% of total IC area). In terms of nutrient loading, private parcels contribute 72% of the total TP and total TN. Loading from IC within private parcels amounts to 94% of the total TP and TN load from private parcels. Private IC load represents 68% and 67% of total TP and total TN, respectively, from all parcels. These results indicate that private parcels contribute nearly three quarters of the nutrient load and may require further stormwater controls for the watershed to meet its water quality goals. Table 3-2 and Table 3-3 provide additional details summarizing the IC area and load for all non-CSA parcels by Use Group and Private/Public designation for TP and TN, respectively.

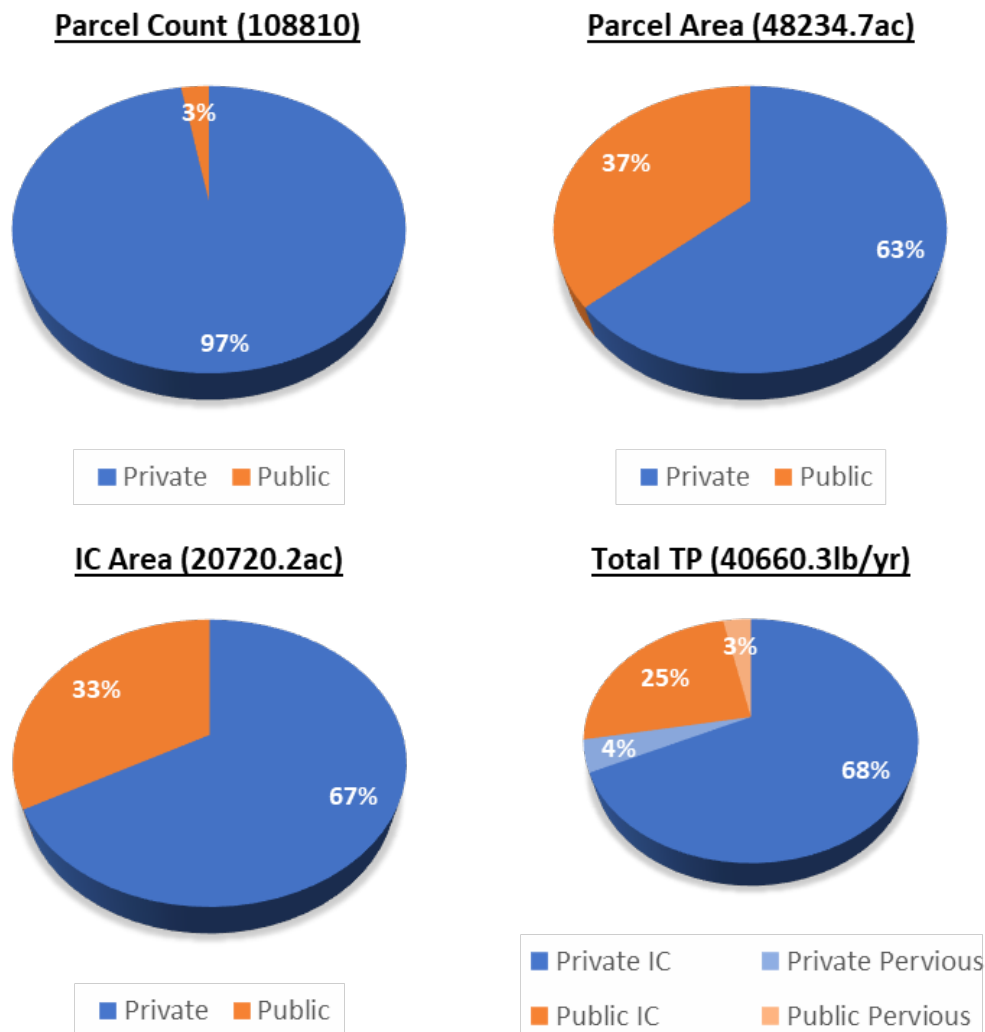


Figure 3-1. Private/Public summaries for all parcels within the Mystic River Watershed.

Table 3-2. Summary of all non-CSA parcel attributes by Use Group and Public/Private designation with TP*

Public/ Private	Use Group	Count	Count (%)	Total Area (ac)	Total Area (%)	IC Area			TP Load (lb/yr)				
						Acre	% IC of Total Area	Avg. (ac)	IC	Pervious	Total	Total (%)	Total Avg.
Private	Agriculture	33	0.03	43.61	0.09	17.28	39.63	0.52	30.80	7.83	38.63	0.10	1.17
	Commercial	4,762	4.38	5,995.85	12.43	3,722.08	62.08	0.78	6,715.53	281.48	6,997.01	17.21	1.47
	Industrial	814	0.75	2,168.77	4.50	1,577.27	72.73	1.94	2,832.82	70.05	2,902.87	7.14	3.57
	MultiFamily Res.	34,696	31.89	5,949.40	12.33	3,593.34	60.40	0.10	8,447.90	278.43	8,726.33	21.46	0.25
	Open Land	5,083	4.67	2,488.56	5.16	397.82	15.99	0.08	687.76	249.53	937.29	2.31	0.18
	Private Inst.	793	0.73	946.53	1.96	385.86	40.77	0.49	688.51	74.14	762.65	1.88	0.96
	Right-of-Way	53	0.05	21.46	0.04	8.91	41.52	0.17	12.69	0.92	13.61	0.03	0.26
	Single Family Res.	59,572	54.75	12,938.05	26.82	4,150.53	32.08	0.07	8,163.34	749.59	8,912.93	21.92	0.15
	Water	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	105,806	97.2	30,552.23	63.3	13,853.10	45.3	--	27,579.35	1,711.97	29,291.33	72.0	--
Public	Agriculture	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	4	0.00	6.38	0.01	4.72	73.98	1.18	8.49	0.33	8.82	0.02	2.21
	Industrial	5	0.00	2.23	0.00	1.49	66.86	0.30	2.68	0.09	2.77	0.01	0.55
	MultiFamily Res.	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Open Land	193	0.18	2,872.88	5.96	23.02	0.80	0.12	37.44	511.22	548.67	1.35	2.84
	Public Inst.	2,447	2.25	6,316.76	13.10	1,280.21	20.27	0.52	2,235.95	576.03	2,811.98	6.92	1.15
	Right-of-Way	293	0.27	7,267.37	15.07	5,546.42	76.32	18.93	7,742.33	209.37	7,951.69	19.56	27.14
	Single Family Res.	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Water	62	0.06	1,216.86	2.52	11.25	0.92	0.18	19.23	25.79	45.02	0.11	0.73
	Subtotal	3,004	2.8	17,682.48	36.7	6,867.11	38.8	--	10,046.13	1,322.83	11,368.96	28.0	--
Total	108,810	100	48,234.72	100	20,720.21	43.0	--	37,625.48	3,034.80	40,660.29	100	--	

* A darker color gradient represents increasing value within a column.

Table 3-3. Summary of all non-CSA parcel attributes by Use Group and Public/Private designation with TN*

Public/ Private	Use Group	Count	Count (%)	Total Area (ac)	Total Area (%)	IC Area			TN Load (lb/yr)				
						Acre	% IC of Total Area	Avg. (ac)	IC	Pervious	Total	Total (%)	Total Avg.
Private	Agriculture	33	0.03	43.61	0.09	17.28	39.63	0.52	259.41	49.55	308.95	0.10	9.36
	Commercial	4,762	4.38	5,995.85	12.43	3,722.08	62.08	0.78	56,141.75	2,755.27	58,897.03	19.59	12.37
	Industrial	814	0.75	2,168.77	4.50	1,577.27	72.73	1.94	23,965.06	590.49	24,555.55	8.17	30.17
	MultiFamily Res.	34,696	31.89	5,949.40	12.33	3,593.34	60.40	0.10	51,172.35	2,092.52	53,264.87	17.72	1.54
	Open Land	5,083	4.67	2,488.56	5.16	397.82	15.99	0.08	5,274.39	1,927.41	7,201.79	2.40	1.42
	Private Inst.	793	0.73	946.53	1.96	385.86	40.77	0.49	5,773.11	568.83	6,341.94	2.11	8.00
	Right-of-Way	53	0.05	21.46	0.04	8.91	41.52	0.17	94.18	6.75	100.92	0.03	1.90
	Single Family Res.	59,572	54.75	12,938.05	26.82	4,150.53	32.08	0.07	59,014.58	5,344.21	64,358.79	21.41	1.08
	Water	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	105,806	97.2	30,552.2	63.3	13,853.1	45.3	--	201,694.8	13,335.0	215,029.9	71.5	--
Public	Agriculture	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Commercial	4	0.00	6.38	0.01	4.72	73.98	1.18	71.89	3.62	75.51	0.03	18.88
	Industrial	5	0.00	2.23	0.00	1.49	66.86	0.30	22.73	0.69	23.42	0.01	4.68
	MultiFamily Res.	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Open Land	193	0.18	2,872.88	5.96	23.02	0.80	0.12	300.24	2,951.68	3,251.92	1.08	16.85
	Public Inst.	2,447	2.25	6,316.76	13.10	1,280.21	20.27	0.52	18,645.26	4,574.74	23,220.00	7.72	9.49
	Right-of-Way	293	0.27	7,267.37	15.07	5,546.42	76.32	18.93	57,047.97	1,669.87	58,717.84	19.53	200.40
	Single Family Res.	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Water	62	0.06	1,216.86	2.52	11.25	0.92	0.18	158.76	166.65	325.41	0.11	5.25
	Subtotal	3,004	2.8	17,682.5	36.7	6,867.1	38.8	--	76,246.8	9,367.3	85,614.1	28.5	--
Total	108,810	100	48,234.7	100	20,720.2	43.0	--	277,941.7	22,702.3	300,644.0	100	--	

* A darker color gradient represents increasing value within a column.

3.2 Commercial, Industrial, Institutional, and Multi-Family Parcels

Commercial, Industrial, Institutional, and Multi-Family parcels make up 37.7% of all parcels and 31.2% of total parcel area in the Mystic River Watershed (Table 3-4). The greatest number of CIIM parcels are Multifamily Residential. On average, however, these parcels have the lowest IC area and total TP and TN loads. Industrial parcels have the highest average IC and load values, followed by Commercial and Institutional. CIIM parcels make up 45% of total IC area and 50% and 49% of total TP and TN load from all IC, respectively. These parcels could be candidates for additional stormwater controls while excluding the regulation of the nearly 60,000 private single family residential parcels.

If all private CIIM parcels installed stormwater controls to reduce TP loads from IC by 62%, the resulting reduction would be 11,584 lb/yr of TP. This equates to 46% of the required TP load reductions. If all public parcels also reduced TP IC load by 62%, the cumulative reduction from private CIIM and all public parcels would be 71% of the required TP load reduction. If the pervious load from private CIIM and all public parcels was also treated, they would contribute an additional 3% and 5% of the required reduction, respectively. These results indicate that it may be necessary to regulate some of the Single Family parcels and/or require a higher level of treatment from CIIM and public parcels.

Table 3-4. Summary of private commercial, industrial, institutional, and multifamily parcel attributes in the Mystic River Watershed

Use Group	Count	Total Area (ac)	IC Area			TP Load (lb/yr)			TN Load (lb/yr)		
			Acre	% IC of Total Area	Parcel Avg. (ac)	IC	Pervious	Parcel Total Avg.	IC	Pervious	Parcel Total Avg.
Commercial	4,762	5,995.85	3,722.08	62.08	0.78	6,715.53	281.48	1.47	56,141.75	2,755.27	12.37
Industrial	814	2,168.77	1,577.27	72.73	1.94	2,832.82	70.05	3.57	23,965.06	590.49	30.17
MultiFamily Residential	34,696	5,949.40	3,593.34	60.40	0.10	8,447.90	278.43	0.25	51,172.35	2,092.52	1.54
Private Institutional	793	946.53	385.86	40.77	0.49	688.51	74.14	0.96	5,773.11	568.83	8.00
Subtotal	41,065	15,060.56	9,278.55	61.61	--	18,684.76	704.10	--	137,052.27	6,007.11	--
Watershed Total (%)	37.7	31.2	44.8	--	--	49.7	23.2	--	51.4	27.7	--

3.2.1 Analysis of CIIM Parcels by IC Area

Even though regulating all CIIM parcels may not achieve all of the required reduction to meet watershed water quality goals, it may be possible to regulate fewer CIIM properties while still getting the majority of the nutrient reduction. The relationship between the number of parcels, the amount of IC area within a parcel, and the total load was evaluated for private CIIM parcels by varying thresholds of IC area as shown Figure 3-2 and Figure 3-3 (Appendix B presents similar plots by individual parcel use group). These plots show that while the IC threshold is relatively large (e.g., ≥ 2 ac), the number of parcels regulated is relatively small, but accounts for approximately half of the private CIIM total load. As the IC threshold decreases below 1 ac, the number of parcels regulated sharply increases, but with lower increases in the total load. An IC threshold of ≥ 0.1 ac exhibits a large increase in the number of parcels regulated because more multifamily residential parcels are included (these parcels have an average IC area of 0.1 ac, as shown in Table 3-4).

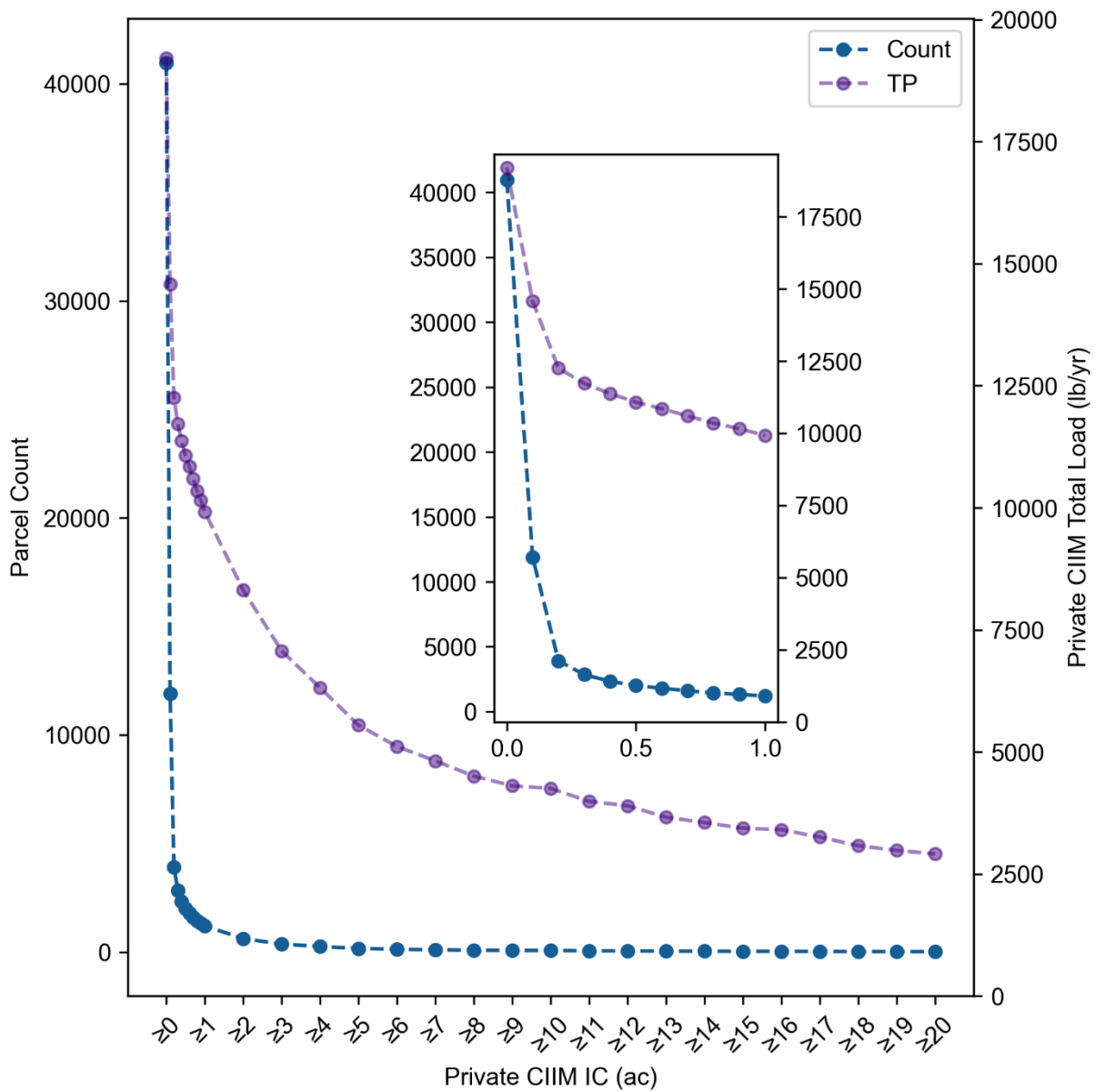


Figure 3-2. Private CIIM parcel count and total TP load by parcel IC area in the Mystic River Watershed. Note that a threshold of ≥ 0 ac IC includes all private CIIM parcels.

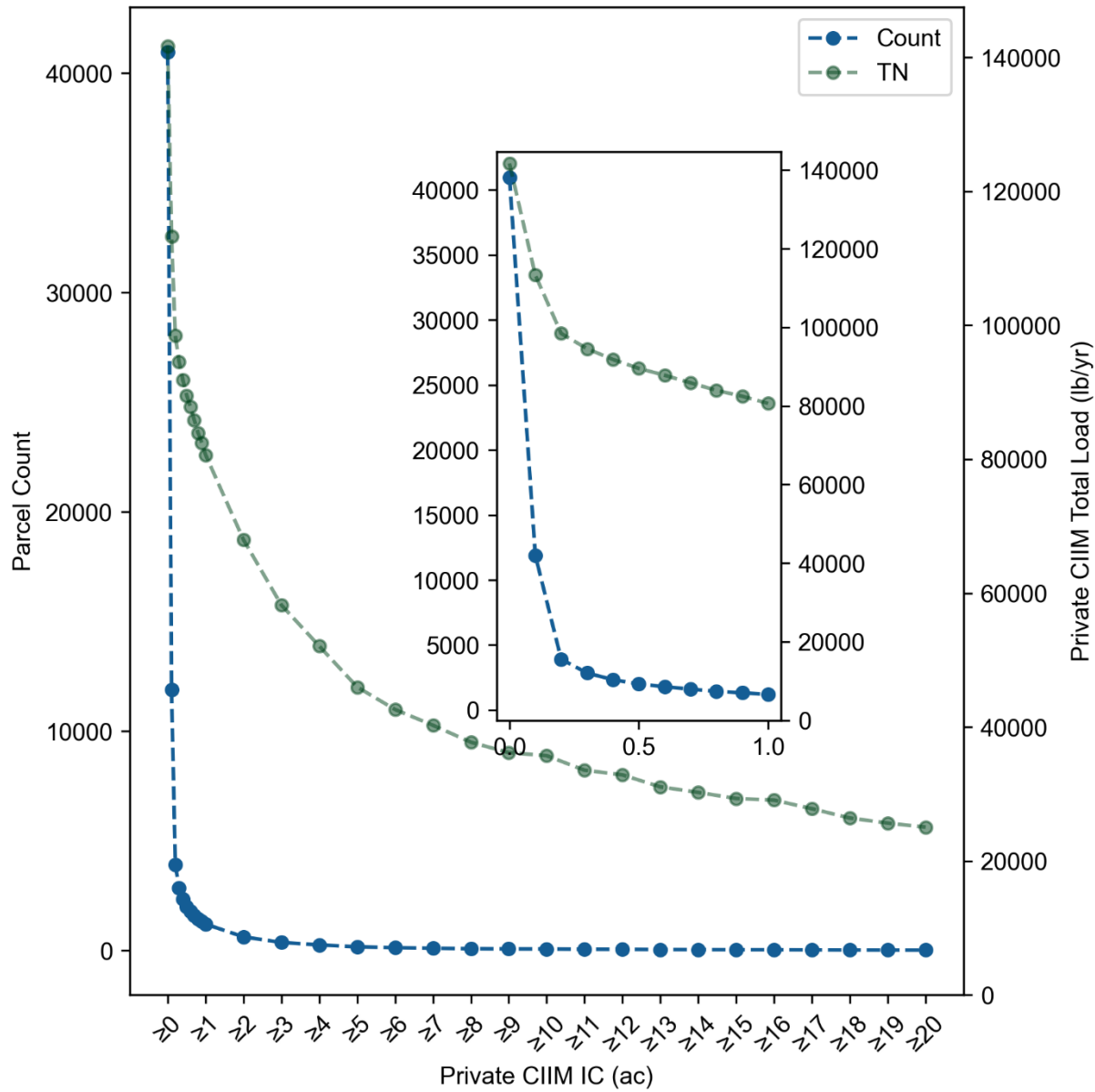


Figure 3-3. Private CIIM parcel count and total TN load by parcel IC area in the Mystic River Watershed. Note that a threshold of ≥ 0 ac IC includes all private CIIM parcels.

The parcel count, load, IC relationship was further analyzed for IC thresholds of 0.25 ac, 0.5 ac, 0.75 ac, 1 ac, 2 ac, and 5 ac as shown in Table 3-5 to Table 3-10. These tables show that, for a small percentage of the total number of parcels, a larger proportion of the IC nutrient load can be controlled. For example, private CIIM parcels with ≥ 0.25 ac of IC represent 3% (3,316) of the total number of parcels but account for 31% of the IC TP load and 34% of the IC TN load from all parcels. Larger IC thresholds require regulating fewer parcels, but with the potential to treat less of the nutrient load.

Table 3-5. Summary of private commercial, industrial, institutional, and multifamily parcels with IC ≥ 0.25 ac in the Mystic River Watershed

Use Group	Count	Total Area (ac)	IC Area		TP Load (lb/yr)			TN Load (lb/yr)		
			Acre	% IC of total Area	IC	Pervious	Total	IC	Pervious	Total
Commercial	1,594	5,564.00	3,389.34	60.92	6,091.80	268.32	6,360.11	51,180.64	2,651.54	53,832.18
Industrial	672	2,127.32	1,559.51	73.31	2,800.93	66.59	2,867.52	23,697.18	564.55	24,261.72
MultiFamily Residential	760	1,699.77	911.48	53.62	2,102.38	114.05	2,216.43	13,020.42	874.77	13,895.19
Private Institutional	290	783.74	341.17	43.53	608.04	61.38	669.42	5,100.45	469.64	5,570.08
Subtotal	3,316	10,174.84	6,201.50	60.95	11,603.15	510.34	12,113.48	92,998.69	4,560.49	97,559.18
Watershed Total (%)	3.0	21.1	29.9	--	30.8	16.8	29.8	33.5	20.1	32.5

Table 3-6. Summary of private commercial, industrial, institutional, and multifamily parcels with IC ≥ 0.5 ac in the Mystic River Watershed

Use Group	Count	Total Area (ac)	IC Area		TP Load (lb/yr)			TN Load (lb/yr)		
			Acre	% IC of total Area	IC	Pervious	Total	IC	Pervious	Total
Commercial	893	5,266.06	3,146.63	59.75	5,655.32	262.71	5,918.03	47,539.89	2,606.27	50,146.16
Industrial	559	2,073.84	1,517.90	73.19	2,726.12	65.44	2,791.56	23,064.02	555.30	23,619.32
MultiFamily Residential	425	1,521.15	794.61	52.24	1,832.17	107.81	1,939.98	11,358.80	826.63	12,185.43
Private Institutional	162	689.73	295.95	42.91	526.62	55.36	581.97	4,420.23	422.17	4,842.40
Subtotal	2,039	9,550.78	5,755.10	60.26	10,740.23	491.31	11,231.54	86,382.93	4,410.38	90,793.31
Watershed Total (%)	1.9	19.8	27.8	--	28.5	16.2	27.6	31.1	19.4	30.2

Table 3-7. Summary of private commercial, industrial, institutional, and multifamily parcels with IC ≥ 0.75 ac in the Mystic River Watershed

Use Group	Count	Total Area (ac)	IC Area		TP Load (lb/yr)			TN Load (lb/yr)		
			Acre	% IC of total Area	IC	Pervious	Total	IC	Pervious	Total
Commercial	660	5,066.46	3,002.39	59.26	5,395.24	256.10	5,651.34	45,372.42	2,551.66	47,924.09
Industrial	472	1,984.89	1,463.39	73.73	2,628.68	59.91	2,688.60	22,241.55	504.87	22,746.42
MultiFamily Residential	298	1,407.97	715.34	50.81	1,648.74	103.73	1,752.47	10,228.42	794.89	11,023.31
Private Institutional	110	636.63	263.47	41.39	467.95	52.42	520.37	3,928.81	399.75	4,328.55
Subtotal	1,540	9,095.94	5,444.59	59.86	10,140.61	472.15	10,612.77	81,771.20	4,251.17	86,022.37
Watershed Total (%)	1.4	18.9	26.3	--	27.0	15.6	26.1	29.4	18.7	28.6

Table 3-8. Summary of private commercial, industrial, institutional, and multifamily parcels with IC ≥ 1 ac in the Mystic River Watershed

Use Group	Count	Total Area (ac)	IC Area		TP Load (lb/yr)			TN Load (lb/yr)		
			Acre	% IC of total Area	IC	Pervious	Total	IC	Pervious	Total
Commercial	511	4,880.41	2,872.52	58.86	5,161.79	248.29	5,410.08	43,436.06	2,486.42	45,922.48
Industrial	394	1,895.59	1,395.21	73.60	2,506.18	57.12	2,563.30	21,204.89	479.59	21,684.48
MultiFamily Residential	227	1,307.45	653.15	49.96	1,503.41	98.97	1,602.38	9,343.60	760.45	10,104.06
Private Institutional	88	606.94	244.81	40.34	434.38	51.31	485.69	3,644.62	390.12	4,034.74
Subtotal	1,220	8,690.39	5,165.70	59.44	9,605.77	455.69	10,061.45	77,629.17	4,116.58	81,745.75
Watershed Total (%)	1.1	18.0	24.9	--	25.5	15.0	24.7	27.9	18.1	27.2

Table 3-9. Summary of private commercial, industrial, institutional, and multifamily parcels with IC ≥ 2 ac in the Mystic River Watershed

Use Group	Count	Total Area (ac)	IC Area		TP Load (lb/yr)			TN Load (lb/yr)		
			Acre	% IC of total Area	IC	Pervious	Total	IC	Pervious	Total
Commercial	262	4,383.27	2,529.14	57.70	4,546.92	232.40	4,779.32	38,298.65	2,356.38	40,655.03
Industrial	212	1,525.94	1,128.07	73.93	2,026.85	44.65	2,071.50	17,151.32	382.34	17,533.66
MultiFamily Residential	118	1,003.22	499.73	49.81	1,150.90	74.38	1,225.29	7,162.64	588.86	7,751.50
Private Institutional	36	491.33	173.05	35.22	305.91	44.71	350.62	2,567.73	332.96	2,900.69
Subtotal	628	7,403.76	4,329.99	58.48	8,030.58	396.14	8,426.72	65,180.34	3,660.53	68,840.87
Watershed Total (%)	0.6	15.3	20.9	--	21.3	13.1	20.7	23.5	16.1	22.9

Table 3-10. Summary of private commercial, industrial, institutional, and multifamily parcels with IC ≥ 5 ac in the Mystic River Watershed

Use Group	Count	Total Area (ac)	IC Area		TP Load (lb/yr)			TN Load (lb/yr)		
			Acre	% IC of total Area	IC	Pervious	Total	IC	Pervious	Total
Commercial	83	3,515.74	1,968.46	55.99	3,535.58	184.35	3,719.93	29,841.07	1,944.87	31,785.94
Industrial	49	810.48	627.09	77.37	1,126.94	22.74	1,149.67	9,537.86	209.80	9,747.66
MultiFamily Residential	27	511.22	223.65	43.75	528.40	44.50	572.90	3,190.35	338.52	3,528.87
Private Institutional	9	248.08	97.27	39.21	169.65	25.95	195.60	1,414.12	192.83	1,606.95
Subtotal	168	5,085.51	2,916.47	57.35	5,360.56	277.54	5,638.10	43,983.40	2,686.02	46,669.42
Watershed Total (%)	0.2	10.5	14.1	--	14.2	9.1	13.9	15.8	11.8	15.5

Figure 3-4 further illustrates the tradeoff between pollutant reduction and the number of private CIIM parcels with IC area ranging from ≥ 20 ac to ≥ 0 ac (i.e., all private CIIM parcels) that would have to install SCMs. This figure assumes that runoff from IC within a parcel would be treated by SCMs sized to achieve the required load reduction target of 62%. The “knee” of the curve, where the slope begins to flatten, indicates the IC threshold where the fewest number of parcels can provide the greatest benefit in terms of TP reduction. For the Mystic River Watershed, this appears to lie between parcels with ≥ 0.2 ac and ≥ 0.75 ac of IC.

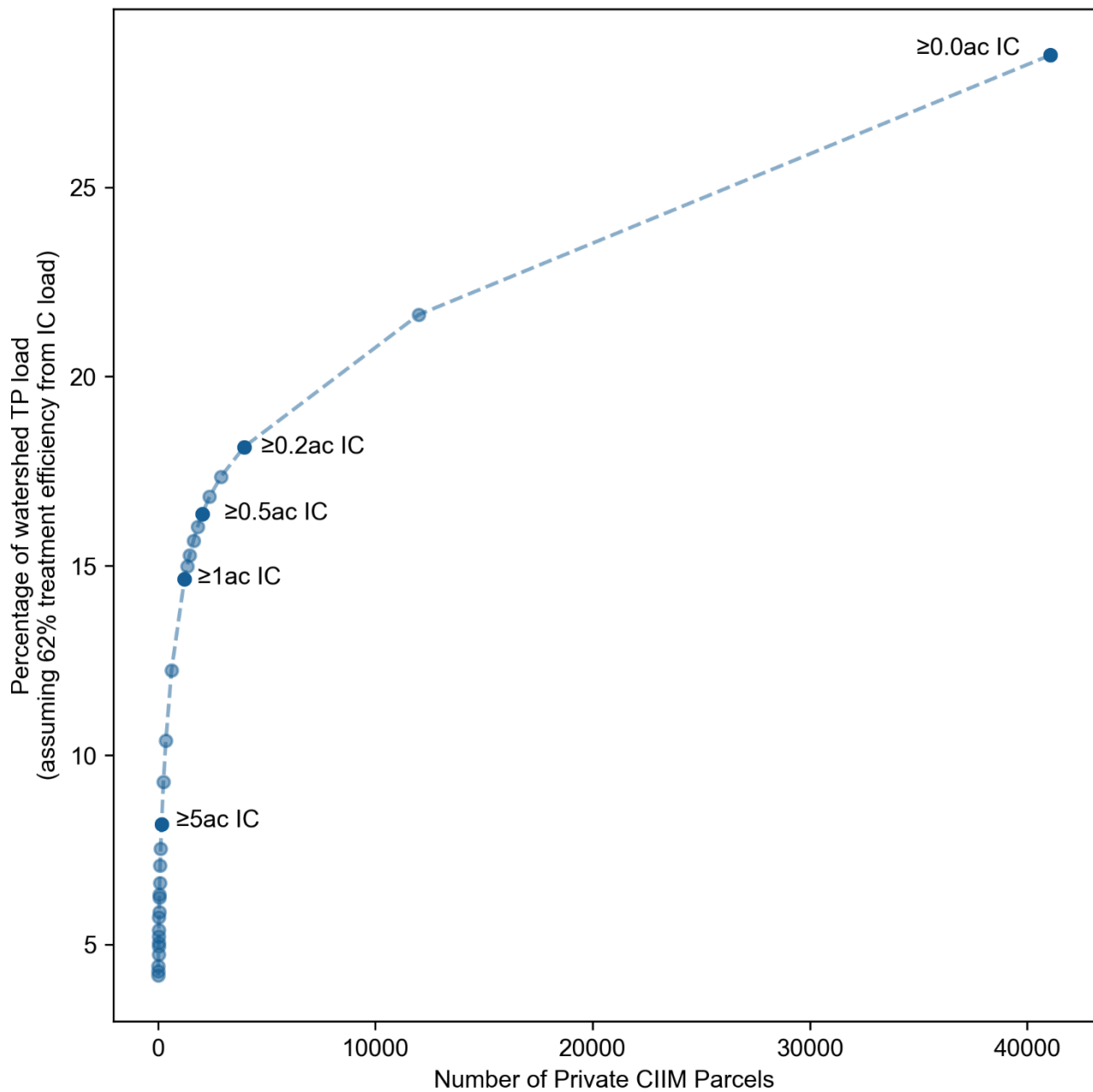


Figure 3-4. Percentage of watershed TP load that can be captured from IC runoff in the Mystic River Watershed, assuming a 62% treatment efficiency, and the corresponding number of private CIIM parcels based on IC threshold. Labels for IC thresholds correspond to the dark blue dots.

4 CONCLUSIONS

This report presented a methodology for summarizing and evaluating stormwater pollutant load from parcels within the Mystic River Watershed that may be used by EPA Region 1 to support decisions regarding the control of stormwater runoff from certain private properties to meet watershed Alternative TMDL goals and WQS. Findings from this analysis include:

1. Private properties contribute nearly three quarters (72%) of the watershed’s total TP load.
2. The majority of TP from private properties is generated from impervious cover (94% of load from private properties and 68% of the watershed total load).
3. Private commercial, industrial, institutional, and multi-family residential (CIIM) properties make up 37.7% of all parcels, but have relatively high percentages of IC and therefore contribute a large proportion of the watershed TP load (48%)
4. Selecting private CIIM parcels based on their IC area (which is proportional to the amount of TP generated) can minimize the number of parcels installing stormwater controls, while providing the greatest TP reduction benefit (Table 4-1).

The findings in this report indicate that the Alternative TMDL goals for TP and other WQS in the Mystic River cannot be met without additional reduction of stormwater runoff and pollutant loads from private parcels. Because the Mystic River Watershed is highly developed, most stormwater runoff from private parcels is likely discharged to a local community’s MS4, ultimately making that municipality responsible for the phosphorus load under their MS4 Permit. While municipalities will likely be responsible for a large portion of the needed phosphorus reductions, placing the entire burden on municipalities will likely not result in sufficient reduction to reach the Alternative TMDL goals and WQS. Designating stormwater discharges from certain classes of private properties for NPDES permits based on the amount of IC area will help reduce the burden on the community that holds an MS4 permit by targeting properties generating the largest amount of phosphorus in stormwater on a per-property scale and makes meeting watershed-wide goals feasible. In any scenario, municipalities will still need to engage the private property owners with smaller property size or IC size to eventually meet the Alternative TMDL goals and WQS. However, requiring action on private properties with larger amounts of IC now through NPDES permitting provides greater flexibility to the communities in deciding which private properties to target to meet their own MS4 permit obligations.

Table 4-1. Summary of private CIIM parcels installing SCMs based on parcel IC area and the reduction achieved in watershed total TP load

IC Threshold (ac)	Parcel Count	Total TP Load (lb/yr)	IC TP Load (lb/yr)	Total TP Treated (%)*
≥0 (All)	41,065	19,388.86	18,684.76	28%
≥0.25	3,316	12,113.48	11,603.15	18%
≥0.5	2,039	11,231.54	10,740.23	16%
≥0.75	1,540	10,612.77	10,140.61	15%
≥1	1,220	10,061.45	9,605.77	15%
≥2	628	8,426.72	8,030.58	12%
≥5	168	5,638.10	5,360.56	8%

* Percentage calculated as IC load times a 62% treatment efficiency divided by the watershed total TP load of 40,660lb/yr.

5 REFERENCES

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- U.S. EPA, 2022b. ATTACHMENT 6 Clean Water Act Residual Designation Determination for Certain Stormwater Discharges in the Charles, Mystic, and Neponset River Watersheds, in Massachusetts: Charles River Watershed Stormwater Total Phosphorus Analysis.
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APPENDIX A

See the accompanying Excel workbook for full preprocessing steps.

Table A1. List of all unique combinations of Use Code, Use Group, Public/Private designation, and example owner

Use Code	Use Code Group	Public/Private	Owner1 (first value returned if multiple)
000	Commercial	Private	KALOGERIS JAMES P
000	MultiFamily Residential	Private	BANDAR OMAR MATTHEW RAYMOND
000	Private Institutional	Private	127 ATLANTIC AVE CONDO ASSOC
000	Public Institutional	Public	COMMONWEALTH OF MASSACHUSETTS
013	Commercial	Private	10 CHIPMAN AVE LLC
014	MultiFamily Residential	Private	805 ADAMS, LLC
031	Commercial	Private	10-16 MT VERNON STREET LLC
034	Commercial	Private	DAM CAMBRIDGE VENTURES II LLC
038	Commercial	Private	OAKLEY COUNTRY CLUB
039	Commercial	Private	
041	Industrial	Private	LONGMUIR,STEPHEN
043	Industrial	Private	GENERATION IV LLC
043	Industrial	Public	MASS ELECTRIC CO
083	Open Land	Private	BEAR HILL ASSOC, INC
091	Private Institutional	Private	
093	Private Institutional	Private	IMMIGRANT LEARNING CENTER THE INC
101	Right-of-Way	Public	
101	Single Family Residential	Private	1 ROBINSON PARK RLTY TRUST
0101	Single Family Residential	Private	132 FOREST STREET REATY TRUST
102	MultiFamily Residential	Private	112-1 PORTER ST RLTRY TR
103	MultiFamily Residential	Private	IMPERIAL REALTY TRUST
104	MultiFamily Residential	Private	1 C.J.M. REALTY TR
0104	MultiFamily Residential	Private	121-123 WINTHROP STREET REALTY TRUST
105	MultiFamily Residential	Private	
0105	MultiFamily Residential	Private	109 COLLEGE AVE LLC
106	Single Family Residential	Private	0 GENEVA STREET LLC
108	MultiFamily Residential	Private	DOUGHERTY EVA
109	MultiFamily Residential	Private	115 GLADSTONE STREET LLC
0109	MultiFamily Residential	Private	GUZEL HASAN OGUZ
111	MultiFamily Residential	Private	10 SHELBY STREET LLC
0111	MultiFamily Residential	Private	100-102 CROSS STREET LLC
112	MultiFamily Residential	Private	1 REVERE BEACH BLVD, LLC
0112	MultiFamily Residential	Private	1359 REALTY TRUST
0113	MultiFamily Residential	Private	16-18-20 SALEM STREET REALTY TRUS

Use Code	Use Code Group	Public/Private	Owner1 (first value returned if multiple)
113	MultiFamily Residential	Private	CITY OF CAMBRIDGE
114	MultiFamily Residential	Private	BC MELROSE LLC
118	MultiFamily Residential	Private	BARNES SCHOOL LIM PARTNER
119	MultiFamily Residential	Private	FROTHINGHAM PL OWNERS ASSOC
120	MultiFamily Residential	Private	JOHN HANCOCK LIFE INSURANCE
121	MultiFamily Residential	Private	218 WASHINGTON STREET LLC
123	MultiFamily Residential	Private	BAILEY, THOMAS C. TRUSTEE OF
125	MultiFamily Residential	Private	ARTIS SENIOR LIVING OF READING
127	MultiFamily Residential	Private	CHEVERUS SCHOOL APTS INC
129	MultiFamily Residential	Private	FRANKFORT GOVE LLC
0130	Commercial	Private	109 WASHINGTON AVE LLC
130	Open Land	Private	101 BALDWIN STREET REALTY TRUST
130	Open Land	Public	REVERE HOUSING AUTHORITY
131	Open Land	Private	117 SUMMER STREET LLC
131	Open Land	Public	REVERE HOUSING AUTHORITY
132	Open Land	Private	1 REVERE BEACH BLVD, LLC
132	Open Land	Public	MODICA ANTONIO
140	Commercial	Private	18 RAY AVENUE LLC
150	MultiFamily Residential	Private	VIDAVER GORDON
199	MultiFamily Residential	Private	11 VAN NORDEN LLC
300	Commercial	Private	1868 MASS AVE LLC
301	Commercial	Private	
302	Commercial	Private	CALVERT/ELLENHORN/PRAKASH LLC
304	Commercial	Private	146 PARK AVE REAL ESTATE LLC
305	Commercial	Private	BJC LLC
306	Commercial	Private	FELDMAN SOLOMON
307	Commercial	Private	BOSTON SAWYERS FAMILY TRUST
0310	Commercial	Private	102 MAIN STREET LLC
310	Commercial	Private	210 WINTHROP STREET REALTY TRUST
311	Commercial	Private	MTHC LLC MASS LLC
312	Commercial	Private	CUBE SMART LP
313	Commercial	Private	ARLINGTON COAL & LUMBER CO
314	Commercial	Private	326 COMMERCIAL STREET
315	Commercial	Private	BOSTON EDISON COMPANY
316	Commercial	Private	11 PRESCOTT STREET LLC
0316	Commercial	Private	A & L DEL LLC
317	Agriculture	Private	211 CONDOR STREET LLC
318	Commercial	Private	100 MAIN STREET READING LLC

Use Code	Use Code Group	Public/Private	Owner1 (first value returned if multiple)
319	Commercial	Private	413-419 BREMEN STREET LLC
320	Commercial	Private	1012-1016 BENNINGTON STREET LLC
0321	Commercial	Private	HILLSIDE MARK SECOND REALTY TRUST
321	Commercial	Private	TNT REAL ESTATE HOLDINGS LLC
0322	Commercial	Private	104-106 PARK PROPERTIES LLC
322	Commercial	Private	
323	Commercial	Private	69 MIDDLESEX LIMITED
324	Commercial	Private	CERRETANI,JOSEPH S TRS
0324	Commercial	Private	MORALES LUIS & BLANCA
325	Commercial	Private	100 VFW PARKWAY LLC
0325	Commercial	Private	306-314 SALEM STREET RELTY TRUST
326	Commercial	Private	107 MAIN STREET READING LLC
0326	Commercial	Private	1150 BROADWAY LLC
327	Commercial	Private	331 SUMNER PROPERTIES LLC
328	Commercial	Private	752 BENNINGTON STREET
329	Commercial	Private	CHARLESTOWN MARINA LLC MASS LLC
330	Commercial	Private	1034 MAIN LLC
330	Commercial	Public	WINCHESTER TOWN OF
331	Commercial	Private	90 CANAL REALTY LLC
332	Commercial	Private	1000 PLEASANT STREET ASSOCIATES LLC
0332	Commercial	Private	MYSTIC LLC
333	Commercial	Private	A L PRIME ENERGY CONSULTANT IN
334	Commercial	Private	100 HIGHLAND AVE REALTY LLC
335	Commercial	Private	1141 REVERE BEACH PKWY RLTY LL
336	Commercial	Private	LS 200 CDP LLC
337	Commercial	Private	11 DARTMOUTH ST PROPERTY LLC
338	Commercial	Private	110 SCHOOL STREET, LLC
340	Commercial	Private	10 BLANCHARD RD LLC
0340	Commercial	Private	23 FOREST STREET REALTY TRUST
341	Commercial	Private	100 PLEASANT LLC
341	Commercial	Public	MASS ELECTRIC CO
342	Commercial	Private	181 CONCORD AVENUE, LLC,
0342	Commercial	Private	82 FOREST STREET TRUST
343	Commercial	Private	203 CITY CENTER LLC
344	Commercial	Private	BRENNAN THOMAS
345	Commercial	Private	1010 SUITE A LLC
346	Commercial	Private	10 FAWCETT INVESTORS, LLC
350	Commercial	Private	BULL REALTY LLC TR 405 CONCORD REALTY TRUST

Use Code	Use Code Group	Public/Private	Owner1 (first value returned if multiple)
351	Commercial	Private	225 BEACH STREET REALTY TRUST
0351	Commercial	Private	ALDORASI CARMEN & ANNA MARIA FOR LIFE
352	Commercial	Private	118 PLEASANT ST REALTY LLC
353	Commercial	Private	51 BREED STREET LLC
354	Commercial	Private	BSREP III 1-3 AIR FORCE ROAD LLC
0355	Commercial	Private	374 BROADWAY/ 165 SYCAMORE REALTY, LLC
355	Commercial	Private	BHATIA NEERAJ TRUSTEE
357	Commercial	Private	GREGORY ROBERT J TS
362	Commercial	Private	BEACON COMMUNITY CHURCH
365	Commercial	Private	
366	Commercial	Private	FROST REALTY
370	Commercial	Private	VOZZELLA ANGELO
373	Commercial	Private	WINCHESTER SWIM CLUB INC
374	Commercial	Private	40 RAY AVE REALTY LLC
375	Commercial	Private	BELMONT HILL CLUB INC
376	Commercial	Private	13 RAY AVENUE LLC
377	Commercial	Private	86 PLEASANT LLC
379	Commercial	Private	SUFFOLK VINE LLC MASS LLC
380	Open Land	Private	BEAR HILL ASSOC, INC
381	Commercial	Private	BURLINGTON CNTRY CLUB INC
383	Commercial	Private	MEDFORD BOAT CLUB CORP
384	Commercial	Private	BEACHMONT YACHT CLUB THE
387	Commercial	Private	279 MAVERICK LLC
388	Commercial	Private	
390	Open Land	Private	144 ADDISON STREET LLC
391	Open Land	Private	320-330 MIDDLESEX AVENUE LLC
391	Open Land	Public	TOWN OF BELMONT
392	Open Land	Private	271 LEE BURBANK REALTY TRUST
393	Open Land	Private	CHARLESTOWN MARINA LLC
395	Commercial	Private	GROSSMAN BERNARD D TRSTS
400	Industrial	Private	1 WASHINGTON STREET GROUP LLC
401	Industrial	Private	120 CANAL ST MALDEN LLC
402	Industrial	Private	ANDERSON JOHN A JR. TRUSTEE
403	Industrial	Private	AMERICAN LANDMARK PARTNERS LP
404	Industrial	Private	20 BLANCHARD 111 SOUTH BEDFORD
406	Industrial	Private	100 DISCOVERY PARK DE, LLC
0406	Industrial	Private	PPF OFF 100 CAMBRIDGEPARK DR LLC
407	Industrial	Private	23 BAY STATE ROAD LIMITED PARTNERSHIP

Use Code	Use Code Group	Public/Private	Owner1 (first value returned if multiple)
410	Industrial	Private	
411	Industrial	Private	29 EAST STREET LLC
414	Industrial	Private	CHANNEL FISH CO INC
420	Industrial	Private	GLOBAL COMPANIES LLC
421	Industrial	Private	
422	Industrial	Private	BOSTON EDISON COMPANY
423	Open Land	Private	BOSTON EDISON CO
424	Industrial	Private	BOSTON EDISON CO
425	Industrial	Private	BOSTON GAS COMPANY
427	Industrial	Private	BOSTON GAS COMPANY
428	Industrial	Private	BOSTON GAS COMPANY
430	Industrial	Private	12 BLANCHARD RD LLC
432	Industrial	Private	38 SWANTON STREET LLC
434	Industrial	Private	
437	Industrial	Private	BAZARIAN BROTHERS LLC MASS LLC
439	Industrial	Private	W KELLY SQUARE REALTY LLC
440	Open Land	Private	35 GREEN STREET LLC
441	Open Land	Private	CAYCORT REALTY LLC
442	Open Land	Private	35 GREEN STREET LLC
444	Industrial	Private	423 PLEASANT REALTY LLC
446	Industrial	Private	605 CHELSEA LLC
465	Industrial	Private	CHELSEA CREEK MARINE
712	Agriculture	Private	LPO ASSOCIATES
801	Open Land	Private	MORRILL STEPHEN E
805	Open Land	Private	BELMONT COUNTRY CLUB INC
900	Public Institutional	Public	U.S. OF AMERICA POST OFFICE
901	Open Land	Public	COMM OF MASS
901	Public Institutional	Public	COMM OF MASS
902	Private Institutional	Private	BOSTON NATURAL AREAS FUND
902	Public Institutional	Public	CITY OF BOSTON
903	Private Institutional	Private	AMBROSE SCHOOL
903	Public Institutional	Public	BOSTON REDEVELOPMENT
904	Private Institutional	Private	CHILDRENS OWN SCHOOL INC
905	Commercial	Private	
905	Private Institutional	Private	A WOMANS CONCERN
905	Public Institutional	Public	WINCHESTER HOSPITAL
906	Private Institutional	Private	AMERICAN LUTHERAN CHURCH
907	Private Institutional	Private	MAVERICK REVITALIZATION CORP

Use Code	Use Code Group	Public/Private	Owner1 (first value returned if multiple)
907	Public Institutional	Public	CITY OF BOSTON
908	Private Institutional	Private	HERITAGE HOUSING CORP
908	Public Institutional	Public	BOSTON HOUSING AUTHORITY
910	Public Institutional	Public	COMM OF MASS
915	Public Institutional	Public	
919	Public Institutional	Public	COMMONWEALTH OF MASS DCR-NORTH REGION
920	Open Land	Public	METROPOLITAN,DISTRICT
920	Public Institutional	Public	CITY OF BOSTON
920	Water	Public	
922	Public Institutional	Public	COMM OF MASS,ARMORY
923	Public Institutional	Public	
924	Public Institutional	Public	COMM OF MASS
925	Open Land	Public	COMM OF MASS,FLOOD CONTROL
926	Public Institutional	Public	COUNTY OF MIDDLESEX
929	Public Institutional	Public	COMMONWEALTH OF MASS
930	Agriculture	Private	
930	Commercial	Private	UNKNOWN,
930	Open Land	Private	UNKNOWN OWNER
930	Private Institutional	Private	WINCHESTER LODGE OF ELKS 1445
930	Public Institutional	Public	BELMONT INHABITANTS
931	Commercial	Private	
931	Open Land	Private	
931	Public Institutional	Public	ARLINGTON REDEVELOPMENT
931	Right-of-Way	Public	
932	Open Land	Private	ARLINGTON CONSERVATION
932	Open Land	Public	CITY OF MELROSE
933	Commercial	Private	
933	Open Land	Private	
933	Public Institutional	Public	CAMBRIDGE, CITY OF
934	Commercial	Private	
934	Open Land	Private	
934	Private Institutional	Private	FOR KIDS ONLY AFTER SCHOOL, IN
934	Public Institutional	Public	BELMONT INHABITANTS OF
935	Commercial	Private	
935	Public Institutional	Public	BELMONT INHABITANTS
936	Private Institutional	Private	KINGSTON FAMILY TRUST
936	Public Institutional	Public	TOWN OF ARLINGTON
938	Open Land	Private	

Use Code	Use Code Group	Public/Private	Owner1 (first value returned if multiple)
938	Public Institutional	Public	TOWN OF BURLINGTON
939	Private Institutional	Private	100% VALUE IN SOMERVILLE
939	Public Institutional	Public	TOWN OF BURLINGTON
940	Commercial	Private	
940	Private Institutional	Private	BELMONT DAY SCHOOL INC
941	Private Institutional	Private	ARCHDIOCESE CENTRAL HIGH SCHOOL INC.
942	Private Institutional	Private	BUCKINGHAM BROWNE AND NICHOLS SCHOOL
943	Commercial	Private	
943	Private Institutional	Private	GEORGE H & IRENE L WALKER HOME
945	Private Institutional	Private	AMERICAN NORTHEASTERN PROVINCE
946	Commercial	Private	
946	Private Institutional	Private	BUCKINGHAM BROWNE AND NICHOLS SCHOOL
947	Private Institutional	Private	ROMAN CATHOLIC ARCHBISHOP
947	Public Institutional	Public	CITY OF BOSTON
950	Open Land	Private	ARLINGTON HISTORICAL SOCIET
951	Private Institutional	Private	HUMAN SERVICES RESEARCH INSTITUTE
952	Private Institutional	Private	ARLINGTON HISTORICAL SOCIET
953	Commercial	Private	
953	Open Land	Private	CATHOLIC CEMETERY ASSOC OF
953	Open Land	Public	CITY OF BOSTON
954	Commercial	Private	
954	Private Institutional	Private	ALOSIA REALTY TRUST 1349
954	Public Institutional	Public	CITY OF REVERE
955	Commercial	Private	
955	Private Institutional	Private	HALLMARK HEALTH LSYSTEM, INC
956	Commercial	Private	
956	Private Institutional	Private	ARLINGTON HISTORICAL SOCIET
956	Public Institutional	Public	TOWN OF ARLINGTON LIBRARY
957	Private Institutional	Private	54 EASTERN AVE MALDEN LLC
958	Commercial	Private	
958	Open Land	Private	ADVOCATE HEALTHCARE OF EAST BOSTON LLC
959	Commercial	Private	
959	MultiFamily Residential	Private	ALTERNATIVE SUPPORTS INC
959	Open Land	Private	
960	Commercial	Private	
960	Open Land	Private	
960	Private Institutional	Private	AMER BAPTIST HOME MISSION SOC
961	Commercial	Private	

Use Code	Use Code Group	Public/Private	Owner1 (first value returned if multiple)
961	Open Land	Private	
961	Private Institutional	Private	ARMENIAN MEMORIAL CHURCH
962	Commercial	Private	
962	Open Land	Private	
962	Private Institutional	Private	ARCHBISHOP OF BOSTON
966	Public Institutional	Public	MASSACHUSETTS PORT AUTHORITY
969	Public Institutional	Public	MASSACHUSETTS PORT AUTH
970	Commercial	Private	
970	Open Land	Private	
970	Private Institutional	Private	BELMONT HILL SCHOOL INC
970	Public Institutional	Public	ARLINGTON HOUSING AUTHORITY
971	Open Land	Private	
971	Public Institutional	Public	BELMONT INHABITANTS
972	Commercial	Private	
972	Public Institutional	Public	M B T A
973	Private Institutional	Private	BUILDING 62 CORP
973	Public Institutional	Public	CITY OF BOSTON
974	Public Institutional	Public	CAMBRIDGE CITY OF
975	Public Institutional	Public	CAMBRIDGE REDEVELOPMENT AUTHORITY
976	Private Institutional	Private	BROOKE CHARTER SCHOOL
976	Public Institutional	Public	CITY OF BOSTON
978	Public Institutional	Public	CITY OF BOSTON
979	Private Institutional	Private	CONSTITUTION OFFICE PARK LE
980	Open Land	Private	
980	Public Institutional	Public	CAMBRIDGE CITY OF
985	Commercial	Private	COMMONWLTH OF MASS
985	Private Institutional	Private	ABCD REAL ESTATE CORP
985	Public Institutional	Public	CAMBRIDGE CITY OF
985	Single Family Residential	Private	COMMONWLTH OF MASS
986	Private Institutional	Private	BOSTON AUTOPORT LLC (LESSEE)
986	Public Institutional	Public	BOSTON REDEVELOPMENT AUTH
988	Public Institutional	Public	CITY OF BOSTON
990	Commercial	Private	
991	Private Institutional	Private	PARTNERS HEALTHCARE SYSTEM
995	Commercial	Private	
995	MultiFamily Residential	Private	
995	Open Land	Private	1 ST CLARE LLC
996	Commercial	Private	

Use Code	Use Code Group	Public/Private	Owner1 (first value returned if multiple)
996	MultiFamily Residential	Private	
996	Open Land	Private	12 HERSAM ST CONDO
997	Commercial	Private	
997	Open Land	Private	OWNER UNKNOWN
1010	Single Family Residential	Private	1 OVERLOOK AVENUE LLC
1014	MultiFamily Residential	Private	11 GRAY GARDENS WEST LLC
1020	MultiFamily Residential	Private	1244 BROADWAY REAL ESTATE PARTNERS LLC
1021	MultiFamily Residential	Private	125-127 SURREY STREET CONDOMINIUM
1040	MultiFamily Residential	Private	00 BRINCHIE TRUST
1050	MultiFamily Residential	Private	10 BOSTON AVE LLC
1060	Single Family Residential	Private	10-14 LAFAYETTE AVE LLC
1090	Single Family Residential	Private	122 HARVARD AVE LLC
1091	Single Family Residential	Private	KANDA, SHUN & KEIKO KANDA, TRUSTEES
1094	Single Family Residential	Private	SARAO, NATALIE M., TRUSTEE OF
1098	Single Family Residential	Private	RICHDALE REALTY LLC
1110	MultiFamily Residential	Private	100 WASHINGTON STREET WOBURN LLC
1120	MultiFamily Residential	Private	110 PERKINS SOMERVILLE LLC
1124	MultiFamily Residential	Private	1020-1024 BEACON STREET REALTY TR
1210	MultiFamily Residential	Private	43 WATER STREET NOMINEE TRUST
1220	MultiFamily Residential	Private	TRUSTEE OF TUFTS COLLEGE
1250	MultiFamily Residential	Private	121 MYSTIC STREET INVESTMENTS, LLC
1300	Open Land	Private	1005 BROADWAY LLC
1310	Open Land	Private	114 PUTNAM STREET LLC
1320	Open Land	Private	10-14 LAFAYETTE AVE LLC
1320	Open Land	Public	MEDICO EDWARD J JR & CONSTANCE LIZIO
1322	Open Land	Private	AP CAMBRIDGE PARTNERS LLC., TR. ACORN
1400	Commercial	Private	168 LEX STREET DEVELOPMENT LLC
1401	Commercial	Private	29 FOREST STREET LLC
2210	Open Land	Private	WINTHROP YACHT CLUB
3000	Commercial	Private	1 RAININ INVESTMENTS LLC
3020	Commercial	Private	MALONSON PHILIP J C/O JAN BECKERT
3040	Commercial	Private	178 LOWELL STREET LLC
3050	Commercial	Private	MVRH REALTY LLC
3100	Commercial	Private	CATAMOUNT PETROLEUM LTD PTNRSH
3110	Commercial	Private	CENTRAL STREET PROPERTIES INC
3130	Commercial	Private	JMJDJL REALTY LLC
3140	Commercial	Private	200 MYSTIC AVENUE REALTY TRUST
3150	Commercial	Private	SHIRLEY WINTHROP LLC

Use Code	Use Code Group	Public/Private	Owner1 (first value returned if multiple)
3160	Commercial	Private	104-106 SPENCER ASSOCIATES LLC
3180	Commercial	Private	AH & RH LLC
3210	Commercial	Private	I-93 SOMERVILLE LLC
3220	Commercial	Private	110 BROADWAY LLC
3221	Commercial	Private	318 LLC
3222	Commercial	Private	BAMPY LLC
3230	Commercial	Private	131 MASS REALTY LLC
3240	Commercial	Private	2151 MYSTIC VALLEY PKWY CO LLC
3250	Commercial	Private	10-26 SOMERSET AV LLC
3260	Commercial	Private	129-131 BROADWAY LLC
3270	Commercial	Private	517 BROADWAY, LLC
3271	Commercial	Private	
3300	Commercial	Private	100-104 MYSTIC AVENUE LLC
3310	Commercial	Private	200-226 EVERETT AVE LLC
3320	Commercial	Private	12 PARK STREET LLC
3330	Commercial	Private	AMERADA HESS FACILITIES
3340	Commercial	Private	151 MAIN STREET MEDFORD LLC
3350	Commercial	Private	ANALETTO BROTHERS INC
3360	Commercial	Private	AVENUE MANAGEMENT LLC
3370	Commercial	Private	19 WOBURN LLC
3371	Commercial	Private	DIV BEACHAN LLC
3380	Commercial	Private	243 MAIN STREET LLC
3400	Commercial	Private	10 PRESIDENTIAL WAY ASSOCIATES
3400	Commercial	Public	PYRAMID COMMUNICATIONS-BOSTON
3401	Commercial	Private	100-1 EVERETT AVENUE LLC
3410	Commercial	Private	19 WOBURN LLC
3420	Commercial	Private	366 BROADWAY SOMERVILLE LLC
3430	Commercial	Private	474 BROADWAY SUITE 110 LLC
3431	Commercial	Private	
3500	Commercial	Private	SNEIRSON GERALD M
3510	Commercial	Private	NC 45-47S CHELSEA LLC
3530	Commercial	Private	12 SAGAMORE AVENUE LLC
3550	Commercial	Private	DELLO RUSSO FREDERICK N TR
3620	Commercial	Private	B F SOMERVILLE PROPERTIES LLC
3640	Commercial	Private	STREET RETAIL INC
3690	Commercial	Private	DWCH ASSEMBLY ROW, LLC
3700	Commercial	Private	GANGI REALTY ENTERPRISES LLC
3710	Commercial	Private	280 SALEM STREET LLC

Use Code	Use Code Group	Public/Private	Owner1 (first value returned if multiple)
3740	Commercial	Private	KOUTALAKIS STEVEN
3750	Commercial	Private	CENNERAZZO JAMES R. GP
3760	Commercial	Private	DELLA G LLC
3770	Commercial	Private	MOE FENCING CLUB LLC
3800	Open Land	Private	WINTHROP GOLF CLUB LESSEE
3840	Commercial	Private	ATLANTIS MARINA DOCKS LLC
3900	Open Land	Private	110 MARGINAL LLC
3910	Open Land	Private	96-102 WINCHESTER STREET LLC
3920	Open Land	Private	125 EAST ALBION STREET L L C
4000	Industrial	Private	1 BRYANT STREET LLC
4010	Industrial	Private	10 LINSOTT RD LLC
4020	Industrial	Private	217 PARK STREET LLC
4021	Industrial	Private	RUSSO REALTY TRUST
4022	Industrial	Private	217-219 NEW BOSTON STREET LLC
4027	Industrial	Private	887 WOBURN LLC
4030	Industrial	Private	22 WILLOW STREET FEE OWNER LLC
4040	Industrial	Private	24 TORRICE DRIVE, LLC
4220	Industrial	Private	NSTAR ELECTRIC COMPANY
4220	Industrial	Public	MASS ELECTRIC CO
4230	Open Land	Private	BOSTON EDISON CO
4230	Open Land	Public	MASS ELECTRIC CO
4240	Industrial	Private	BOSTON EDISON CO
4240	Industrial	Public	MASS ELECTRIC CO
4241	Industrial	Private	MASSACHUSETTS ELECTRIC CO
4280	Industrial	Private	MALDEN & MELROSE GAS CO
4300	Industrial	Private	NE TELEPHONE CO/VERIZON NEW ENGLAND INC
4310	Industrial	Private	INDEPENDENT ORDER OF ODD FELLOWS
4320	Industrial	Private	CONTINENTAL CABLE VISION
4330	Industrial	Private	FELLSWAY ASSOCIATES LLC
4400	Open Land	Private	201 MARGINAL STREET LLC
4400	Open Land	Public	MASS ELECTRIC CO
4401	Open Land	Private	
4410	Open Land	Private	1095R MAIN STREET LLC
4420	Open Land	Private	1095R MAIN STREET LLC
4420	Open Land	Public	MASS ELECTRIC CO
4509	Industrial	Private	
7190	Agriculture	Private	MAHONEY'S WOBURN REAL ESTATE LLC
8110	Open Land	Private	PEACOCK FARMS ASSOCIATION INC

Use Code	Use Code Group	Public/Private	Owner1 (first value returned if multiple)
9000	Public Institutional	Public	UNITED STATES OF AMERICA
9010	Public Institutional	Public	COMMONWEALTH OF MASS
9030	Commercial	Private	TOWN OF WINTHROP (RUNWAYS&FLATS)
9030	Public Institutional	Public	LEXINGTON HOUSING ASSISTANCE BOARD INC
9040	Private Institutional	Private	CHRISTIAN HIGH SCHOOL
9050	Private Institutional	Private	A BETTER PLACE LLC
9060	Private Institutional	Private	CONGR ABRAHAM ANSHEI LEBOVITZ
9080	Public Institutional	Public	LEXINGTON HOUSING ASSISTANCE BOARD INC
9090	Private Institutional	Private	PILGRIM CONGREGATIONAL CHURCH
9090	Public Institutional	Public	TOWN OF ARLINGTON
9100	Open Land	Public	MDC
9100	Private Institutional	Private	TRS SUPREME COUNCIL OF ANCIENT ACCEPTED
9100	Public Institutional	Public	DCR
9130	Public Institutional	Public	MASSACHUSETTS COMMONWEALTH OF
9140	Public Institutional	Public	COMMONWEALTH OF MASSACHUSETTS
9170	Public Institutional	Public	MASSACHUSETTS COMMONWEALTH OF
9200	Open Land	Private	
9200	Private Institutional	Private	FOR KIDS ONLY AFTERSCHOOL, INCORPORATED
9200	Public Institutional	Public	M D C
9220	Public Institutional	Public	MASSACHUSETTS COMMONWEALTH
9240	Public Institutional	Public	COMMONWEALTH OF MA
9250	Open Land	Public	M D C
9250	Public Institutional	Public	M D C
9252	Open Land	Public	M D C
9252	Public Institutional	Public	M D C
9260	Public Institutional	Public	COUNTY OF MIDDLESEX
9280	Public Institutional	Public	COMM OF MASS
9290	Public Institutional	Public	BOSTON & MAINE RR
9292	Public Institutional	Public	MBTA
9300	Open Land	Private	OWNER UNKNOWN
9300	Open Land	Public	MEDFORD CITY OF
9300	Private Institutional	Private	46-48 FOWLE STREET RLTY TRUST
9300	Public Institutional	Public	BOSTON CITY OF
9310	Public Institutional	Public	BOSTON CITY OF
9311	Public Institutional	Public	CHELSEA CITY OF
9320	Open Land	Public	CITY OF WOBURN
9340	Public Institutional	Public	CHELSEA CITY OF
9341	Public Institutional	Public	MEDFORD CITY OF

Use Code	Use Code Group	Public/Private	Owner1 (first value returned if multiple)
9350	Public Institutional	Public	CITY OF SOMERVILLE
9351	Public Institutional	Public	CHELSEA CITY OF
9360	Public Institutional	Public	CHELSEA CITY OF
9390	Public Institutional	Public	MIDDLESEX COUNTY
9401	Private Institutional	Private	IGLESIA DE DIOS PENTECOSTAL
9403	Private Institutional	Private	CAMBRIDGE FRIENDS SCHOOL INC
9420	Private Institutional	Private	TUFTS UNIVERSITY
9421	Private Institutional	Private	TRUSTEES OF TUFTS COLLEGE
9430	Private Institutional	Private	AGASSIZ PRESCHOOL INC
9431	Private Institutional	Private	SHORE EDUCATIONAL COLLABORATIVE
9431	Public Institutional	Public	CITY OF MEDFORD
9450	Private Institutional	Private	TUFTS COLLEGE TRUSTEES OF
9451	Private Institutional	Private	TUFTS COLLEGE TRUSTEES OF
9460	Private Institutional	Private	IGLESIA DE DIOS PENTECOSTAL
9470	Private Institutional	Private	CARY HOUSE ASSOCIATION
9471	Private Institutional	Private	TUFTS COLLEGE TRUSTEES OF
9500	Open Land	Private	ARONSON ALTER
9510	Private Institutional	Private	COMMUNITY FAMILY INC
9511	Private Institutional	Private	ELIOT COMMUNITY HUMAN SERVICES INC
9512	Private Institutional	Private	DIALYSIS CLINIC INC
9513	Private Institutional	Private	SPAULDING REHAB HOSP CORP
9530	Open Land	Public	CITY OF SOMERVILLE
9530	Private Institutional	Private	MT AUBURN CEMETERY CORPORATION
9540	Private Institutional	Private	DISABLED AMERICAN VETERANS OF
9541	Private Institutional	Private	MEDFORD LODGE 915
9550	Private Institutional	Private	CAMBRIDGE PUBLIC HEALTH COMM
9552	Private Institutional	Private	ADMIRALS HILL ASSISTED LIVING CORP II
9560	Private Institutional	Private	MEDFORD HISTORICAL SOCIETY
9560	Public Institutional	Public	CITY OF SOMERVILLE
9570	Private Institutional	Private	COOPERATIVE FOR HUMAN SERVICES, INC
9571	Private Institutional	Private	BOSTON SEAMANS FRIENDS SOCIETY INC
9572	Private Institutional	Private	COMMUNITY ACTION TRUST INC
9582	Open Land	Private	BOYS & GIRLS CLUB OF BOSTON INC
9590	MultiFamily Residential	Private	CASCAP INC
9591	MultiFamily Residential	Private	BAY COVE HUMAN SERVICES INC
9592	MultiFamily Residential	Private	A BETTER PLACE LLC
9600	Private Institutional	Private	AGODASH ACHIM
9601	Private Institutional	Private	SEVENTH DAY ADVENTISTS

Use Code	Use Code Group	Public/Private	Owner1 (first value returned if multiple)
9602	Private Institutional	Private	AL-HUDA SOCIETY INC
9610	Private Institutional	Private	CHABAD OF MEDFORD INC
9611	Private Institutional	Private	CONGREGATION DE LAS HERMANAS
9612	Private Institutional	Private	ROMAN CATHOLIC ARCHBISHOP
9620	Private Institutional	Private	TOWARD INDEPENDENT LIVING & LEARNING INC
9621	Private Institutional	Private	FIRST METHODIST CHURCH
9622	Private Institutional	Private	EVANGELICAL HAITIAN CHURCH
9700	Public Institutional	Public	CAMBRIDGE HOUSING AUTHORITY
9701	Private Institutional	Private	CAMBRIDGE AFFORDABLE HOUSING CORP.
9701	Public Institutional	Public	CAMBRIDGE HOUSING AUTHORITY
9703	Private Institutional	Private	CAMBRIDGE AFFORDABLE PRESIDENTIAL
9710	Public Institutional	Public	COMM OF MASS
9720	Public Institutional	Public	MBTA
9721	Public Institutional	Public	COMMONWEALTH OF MASSACHUSETTS
9730	Public Institutional	Public	CHELSEA HOUSING AUTHORITY
9740	Public Institutional	Public	MASS ELECTRIC CO
9750	Public Institutional	Public	BOSTON & MAINE RR
9800	Public Institutional	Public	BOSTON CITY OF
9810	Public Institutional	Public	CITY OF SOMERVILLE
9960	Open Land	Private	12 JONES AVENUE CONDOMINIUM
9970	Open Land	Private	OWNER UNKNOWN
9970	Private Institutional	Private	PL 500 RIVERS EDGE DRIVE LLC
9970	Public Institutional	Public	MASSACHUSETTS COMMONWEALTH OF
9972	Private Institutional	Private	PL 400 RIVERS EDGE DRIVE LLC
9980	Commercial	Private	OWNER UNKNOWN
010J	MultiFamily Residential	Private	BOYER JEAN P & MARIE F (TE)
010L	MultiFamily Residential	Private	TRAN VAN
011C	MultiFamily Residential	Private	IRVING PLACE LLC
011V	MultiFamily Residential	Private	872 BROADWAY LLC
013C	Commercial	Private	120 COMMERCE APARTMENTS LLC
031V	Commercial	Private	AH & RH LLC
032I	Commercial	Private	350 WASHINGTON PROPERTIES LLC
032L	Commercial	Private	AJ MANAGEMENT LLC
032R	Commercial	Private	KITMIRIDIS GEORGE & SOULA
034I	Commercial	Private	WAXMAN STEVEN
034R	Commercial	Private	BROADWAY INVESTMENT REALTY LLC
035I	Commercial	Private	SMITH MICHAEL J
102V	MultiFamily Residential	Private	SHEN YUAN KUI

Use Code	Use Code Group	Public/Private	Owner1 (first value returned if multiple)
106V	Single Family Residential	Private	1482 MYSTIC VALLEY PARKWAY REALTY TRUST
111C	MultiFamily Residential	Private	115 SHURTLEFF STREET REALTY TRUST
111V	MultiFamily Residential	Private	171 CEDAR STREET LLC
112C	MultiFamily Residential	Private	106-108 THURSTON REALTY LLC
112V	MultiFamily Residential	Private	115 THURSTON ST LLC
125R	MultiFamily Residential	Private	LEXINGTON SENIOR HOUSING OWNER LLC
310I	Commercial	Private	295 EASTERN AVENUE INC
310S	Commercial	Private	CATAMOUNT PETROLEUM LTD PTNRSH
314I	Commercial	Private	128 EASTERN AVE LLC
316I	Commercial	Private	139 ESSEX ST LLC
316I	Commercial	Public	CHELSEA CITY OF
316V	Commercial	Private	CONSOLIDATED REALTY CORP
321I	Commercial	Private	CHELSEA FLOOR COVERING CO
322I	Commercial	Private	180-184 BROADWAY CHELSEA LLC
322L	Commercial	Private	PONKIM LLC
322V	Commercial	Private	CALVO ALBERT & IANNOTTI VIVIAN TRUSTEES
325I	Commercial	Private	354 WASHINGTON PROPERTIES LLC
325V	Commercial	Private	CALVO ALBERT & IANNOTTI VIVIAN TRUSTEES
326I	Commercial	Private	NC 105E CHELSEA LLC
332I	Commercial	Private	ALBA DESIMONE REALTY TRUST
332S	Commercial	Private	ALBA ANTHONY G TRUSTEE
334S	Commercial	Private	EVANGELIS GREGORY M & PATRICIA
337I	Commercial	Private	LORRAINE REALTY TRUST
340I	Commercial	Private	688 BROADWAY LLC
340V	Commercial	Private	SNEIRSON GERALD M
353V	Commercial	Private	TIBETAN ASSOCIATION OF BOSTON INC
355V	Commercial	Private	TORF FUNERAL SERVICE, INC
384V	Commercial	Private	DEVELOPMENT & MARKETING GROUP
400V	Industrial	Private	MERULLO ROBERT M
402C	Industrial	Private	NC 101S CHELSEA LLC
402I	Industrial	Private	CARTER STREET LLC
424V	Industrial	Private	NSTAR ELECTRIC CO
433V	Industrial	Private	INDUSTRIAL TOWER AND WIRELESS LLC
800C	Open Land	Private	MASS RIFLE ASSOCIATION
901I	Private Institutional	Private	RTC REALTY TRUST
903I	Public Institutional	Public	TOWN OF LEXINGTON
903R	Private Institutional	Private	LEX HISTORICAL SOCIETY
903R	Public Institutional	Public	LEXINGTON HOUSING ASSISTANCE BOARD INC

Use Code	Use Code Group	Public/Private	Owner1 (first value returned if multiple)
903V	Public Institutional	Public	INHABITANTS OF ARLINGTON - PUB
904I	Private Institutional	Private	LEXINGTON CHRISTIAN ACADEMY
905R	Private Institutional	Private	YOUVILLE PLACE INC
906C	Private Institutional	Private	DHARMA DRUM MOUNTAIN MASS BUDDHIST ASSOC
913C	Public Institutional	Public	MASSACHUSETTS COMMONWEALTH OF
913I	Public Institutional	Public	MASSACHUSETTS COMMONWEALTH OF
920C	Public Institutional	Public	LEX VETERANS OF FOREIGN WARS
920V	Private Institutional	Private	SCOTTISH RITE MASONIC MUSEUM AND
920V	Public Institutional	Public	COMM OF MASS
925I	Open Land	Public	COMMONWEALTH OF MASSACHUSETTS
926C	Public Institutional	Public	MASSACHUSETTS GOVT LAND BANK
928V	Public Institutional	Public	MASSACHUSETTS COMMONWEALTH OF
929C	Public Institutional	Public	COMMONWEALTH OF MASSACHUSETTS
929I	Public Institutional	Public	MASSACHUSETTS PORT AUTHORITY
930C	Public Institutional	Public	CITY OF SOMERVILLE
931A	Public Institutional	Public	LEXINGTON HOUSING ASSISTANCE BOARD INC
931R	Public Institutional	Public	WOBURN CITY OF
942C	Private Institutional	Private	NORTHEASTERN UNIV OF BOSTON
942V	Private Institutional	Private	LESLEY UNIVERSITY
950C	Open Land	Private	BOYS & GIRLS CLUB OF WOBURN
950I	Open Land	Private	AMERICAN LEGION POST #101
950R	Open Land	Private	ELIOT COMMUNITY HUMAN SERVICES INC
957R	Private Institutional	Private	CSHD3 INC.
959R	MultiFamily Residential	Private	BROADWAL INC
960C	Private Institutional	Private	ANCHOR BAPTIST CHURCH
960I	Private Institutional	Private	ST CHARLES RECTORY
960R	Private Institutional	Private	THE GUILD FOR HUMAN
960V	Private Institutional	Private	CHURCH OF THE NAZERENE
970C	Public Institutional	Public	SOMERVILLE HOUSING AUTH
972V	Public Institutional	Public	COMM OF MASS
	Commercial	Private	
	MultiFamily Residential	Private	
	Open Land	Private	
	Open Land	Public	
	Right-of-Way	Private	
	Right-of-Way	Public	
	Water	Public	

APPENDIX B

See the accompanying Excel workbook for the data used to create these plots.

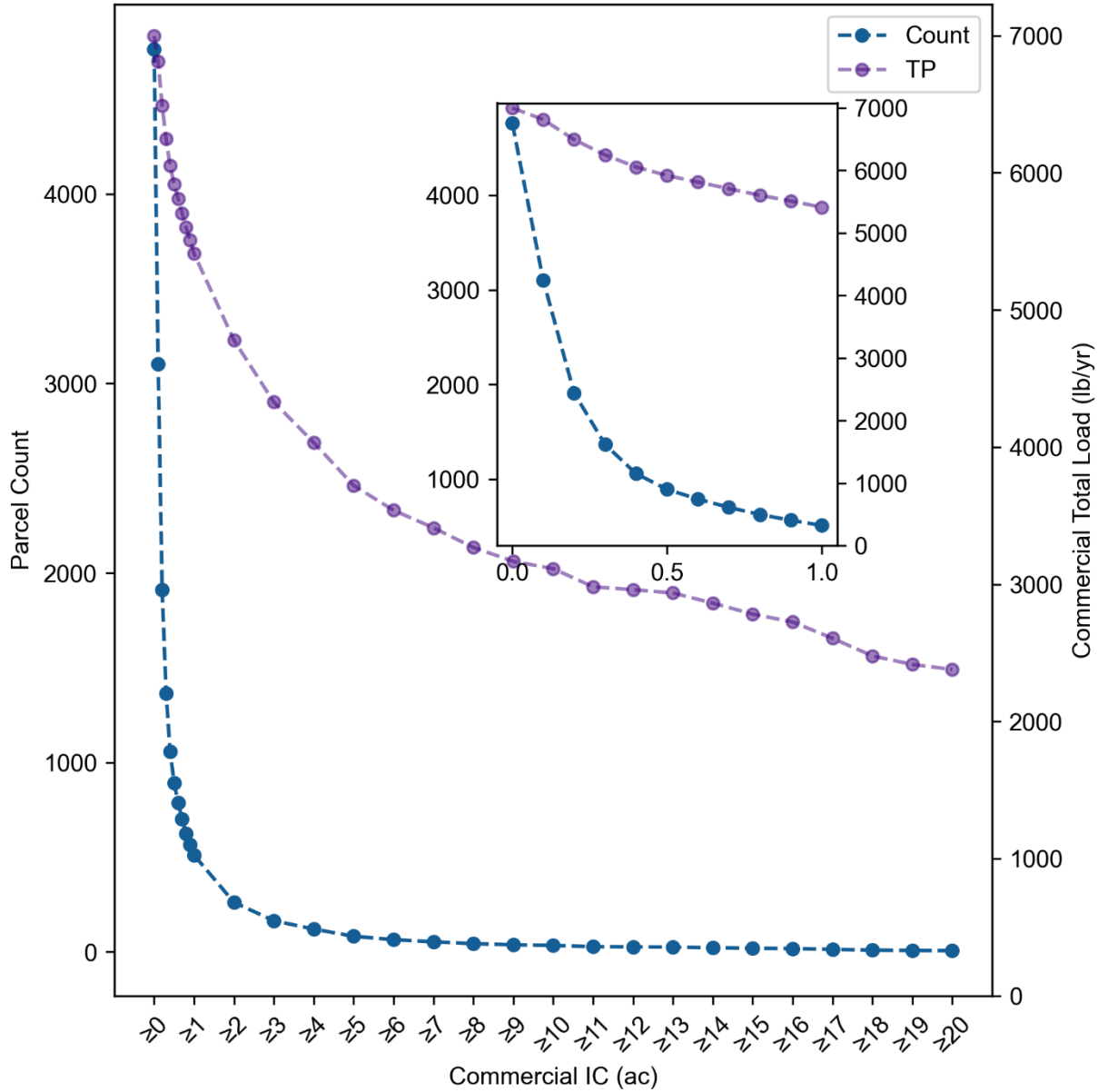


Figure B-1. Private commercial parcel count and total TP load by parcel IC area. Note that a threshold of ≥ 0 ac IC includes all private commercial parcels.

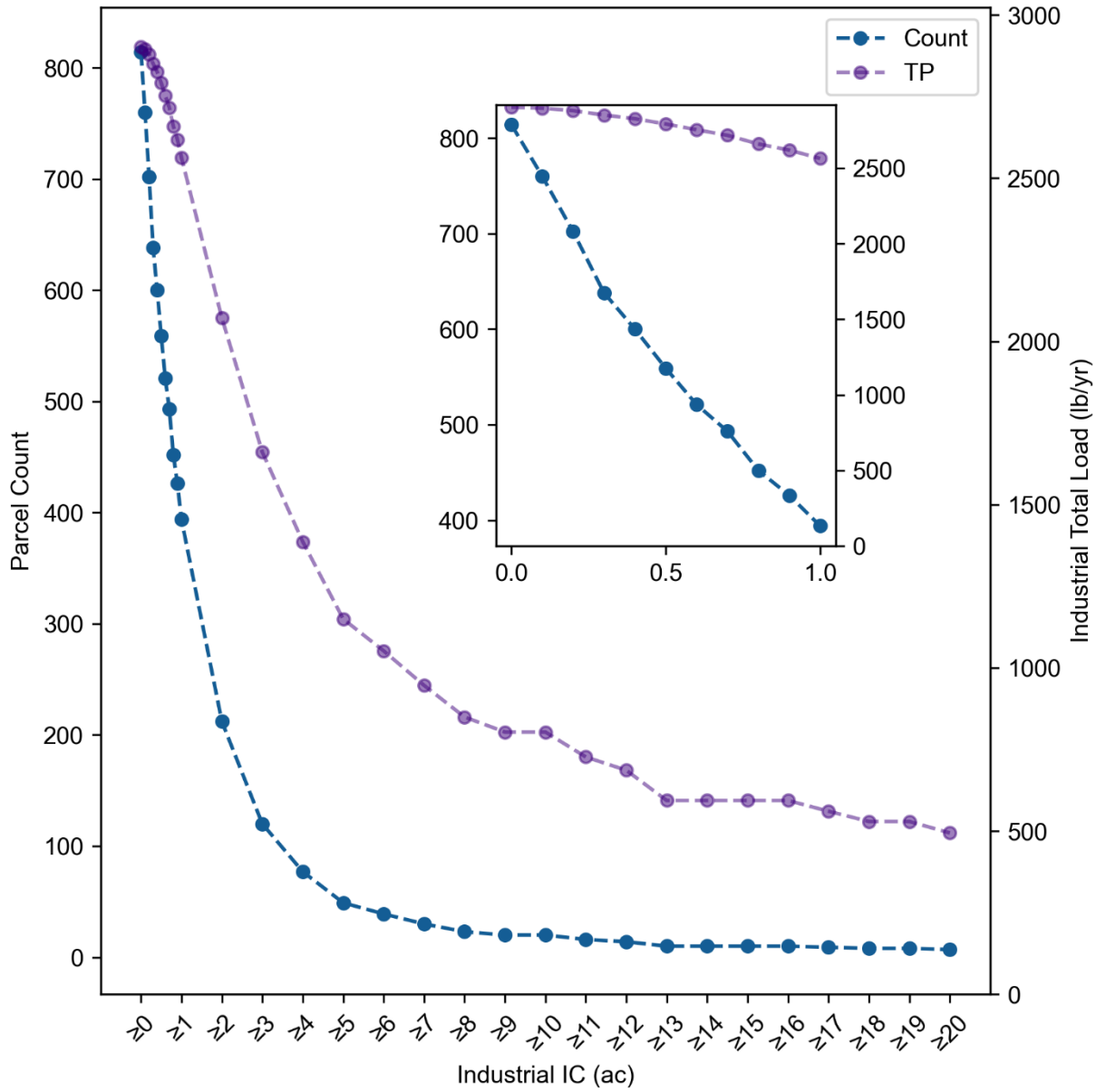


Figure B-2. Private industrial parcel count and total TP load by parcel IC area. Note that a threshold of ≥ 0 ac IC includes all private industrial parcels.

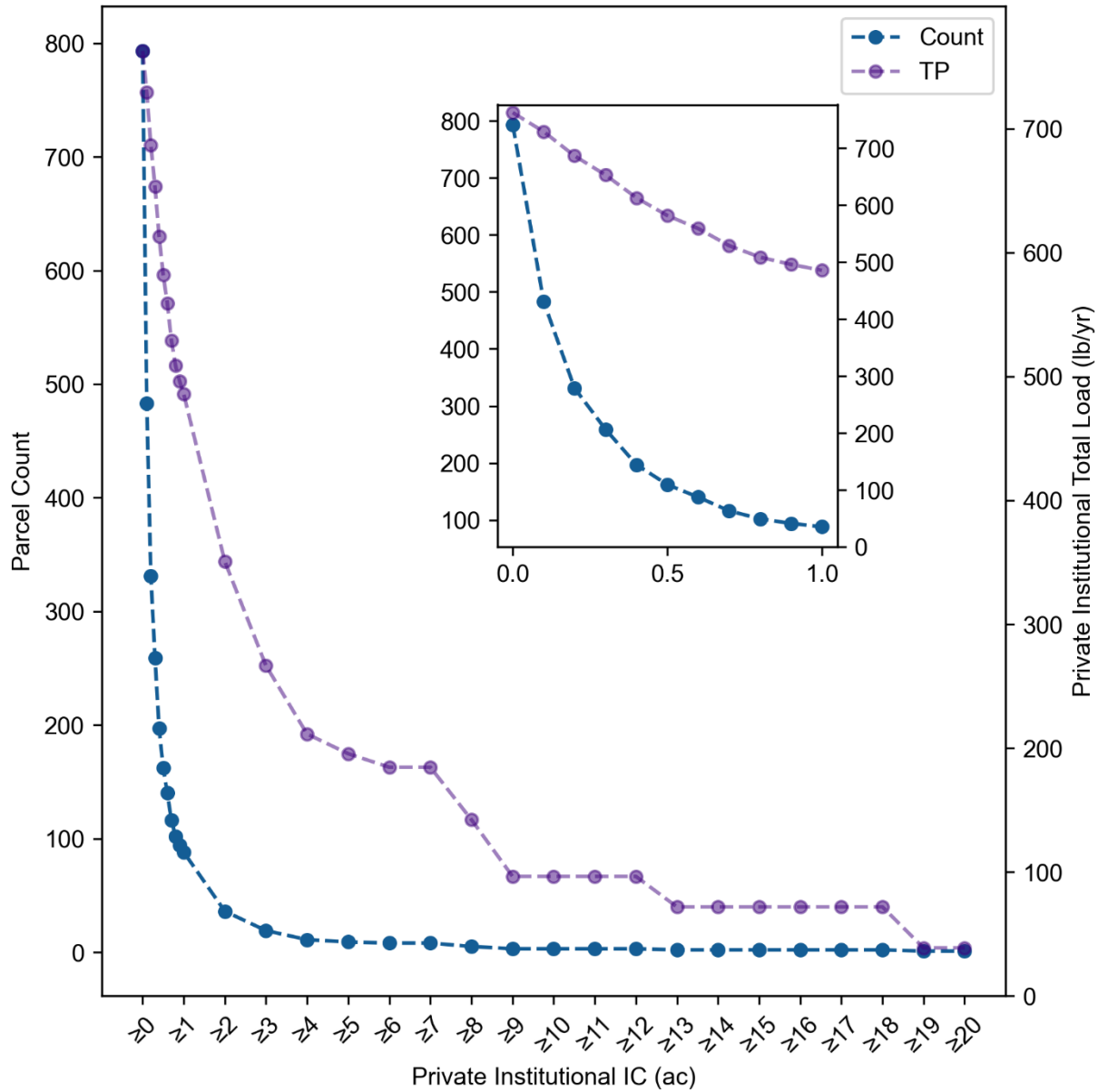


Figure B-3. Private institutional parcel count and total TP load by parcel IC area. Note that a threshold of ≥ 0 ac IC includes all private institutional parcels.

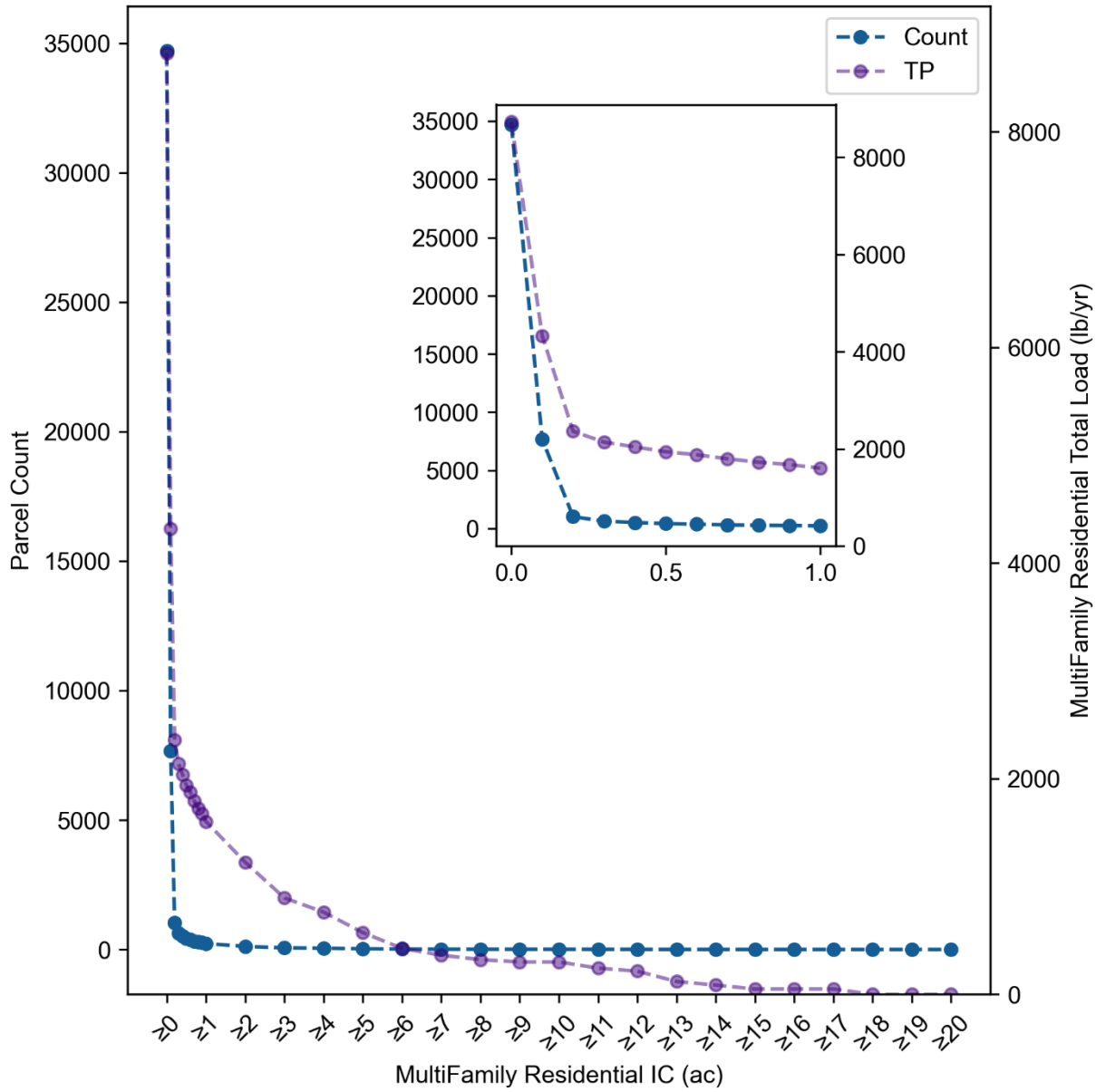


Figure B-4. Private multifamily residential parcel count and total TP load by parcel IC area. Note that a threshold of ≥ 0 ac IC includes all private multifamily residential parcels.

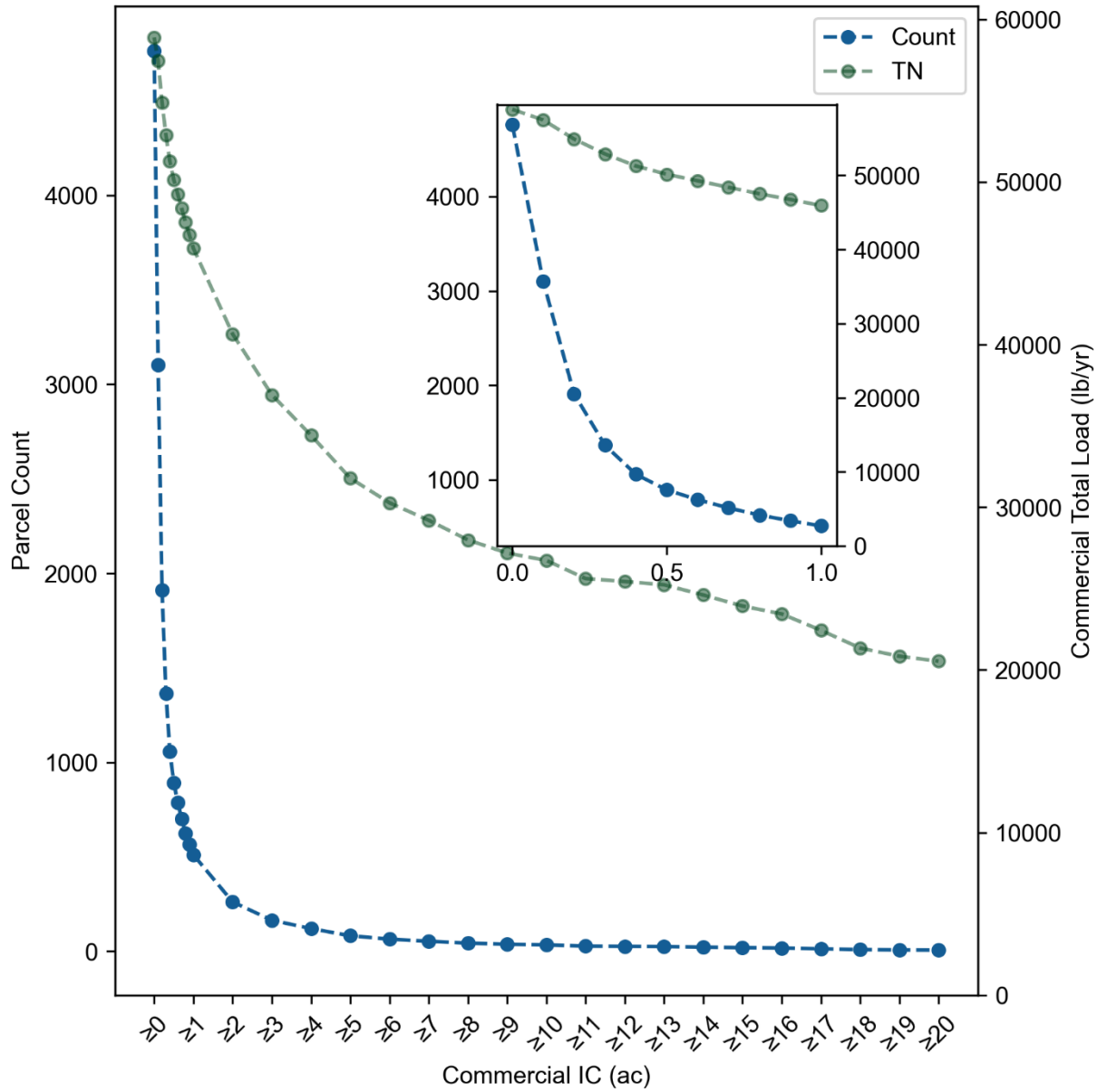


Figure B-5. Private commercial parcel count and total TN load by parcel IC area. Note that a threshold of ≥ 0 ac IC includes all private commercial parcels.

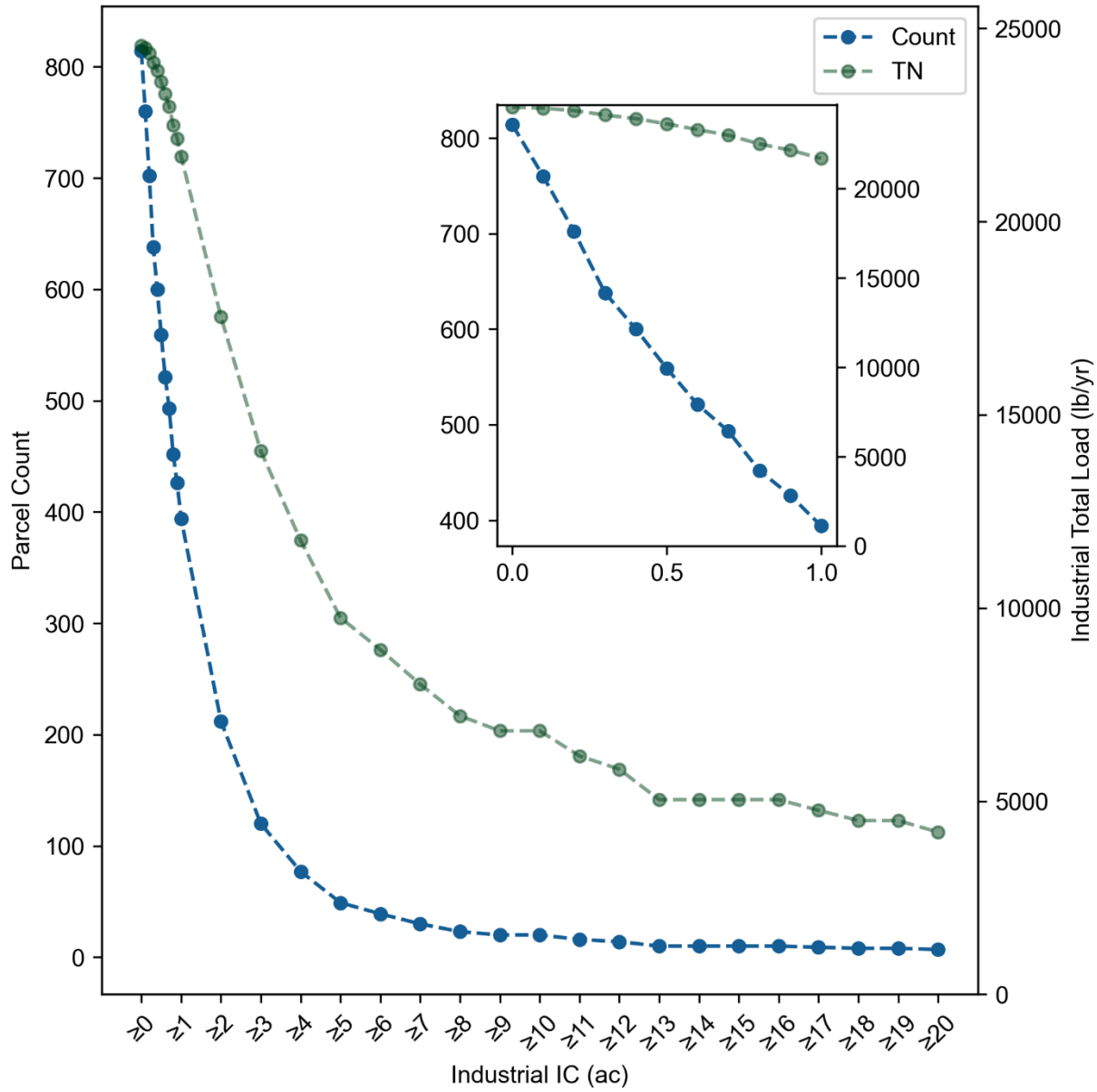


Figure B-6. Private industrial parcel count and total TN load by parcel IC area. Note that a threshold of ≥ 0 ac IC includes all private industrial parcels.

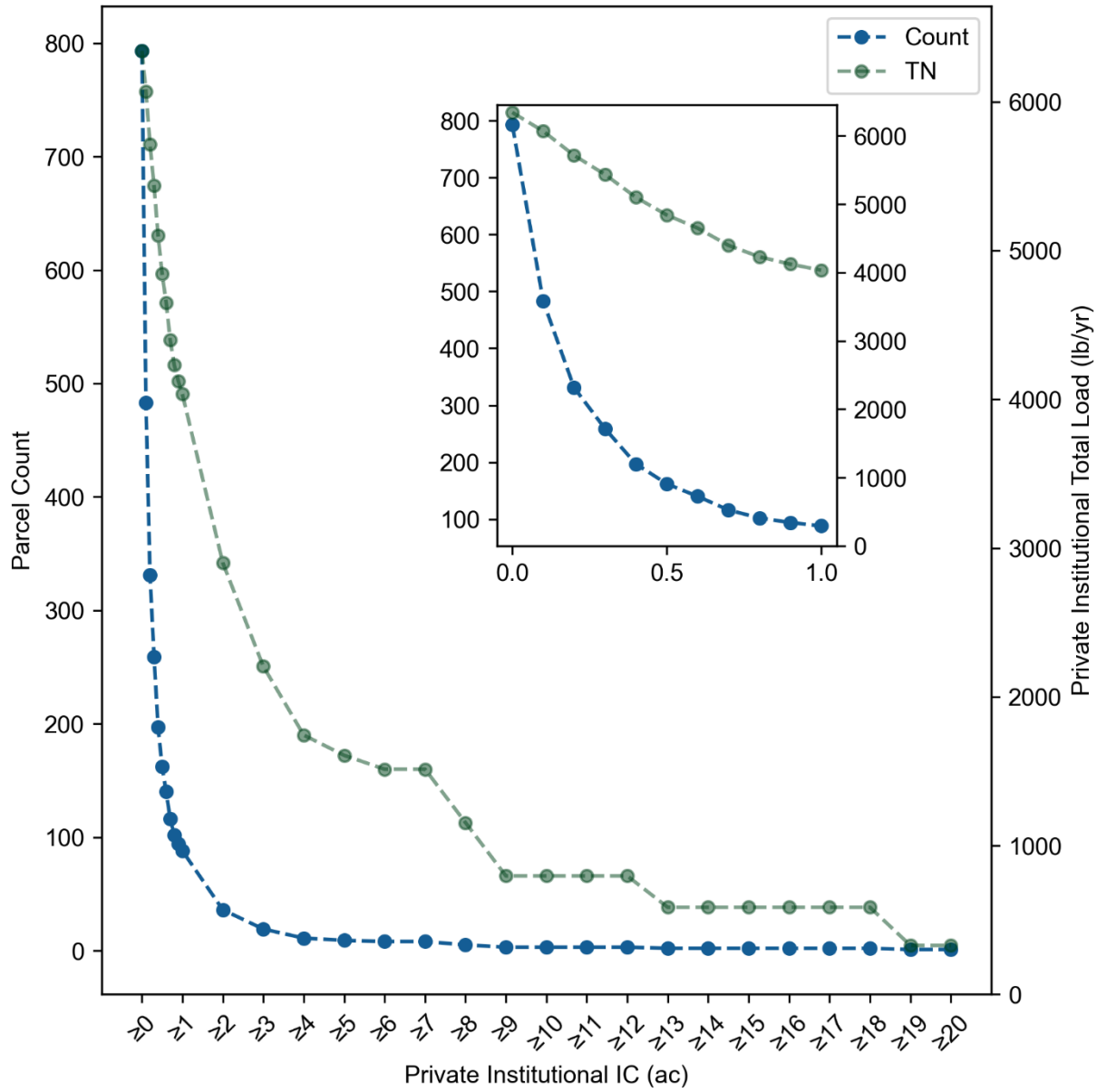


Figure B-7. Private institutional parcel count and total TN load by parcel IC area. Note that a threshold of ≥ 0 ac IC includes all private institutional parcels.

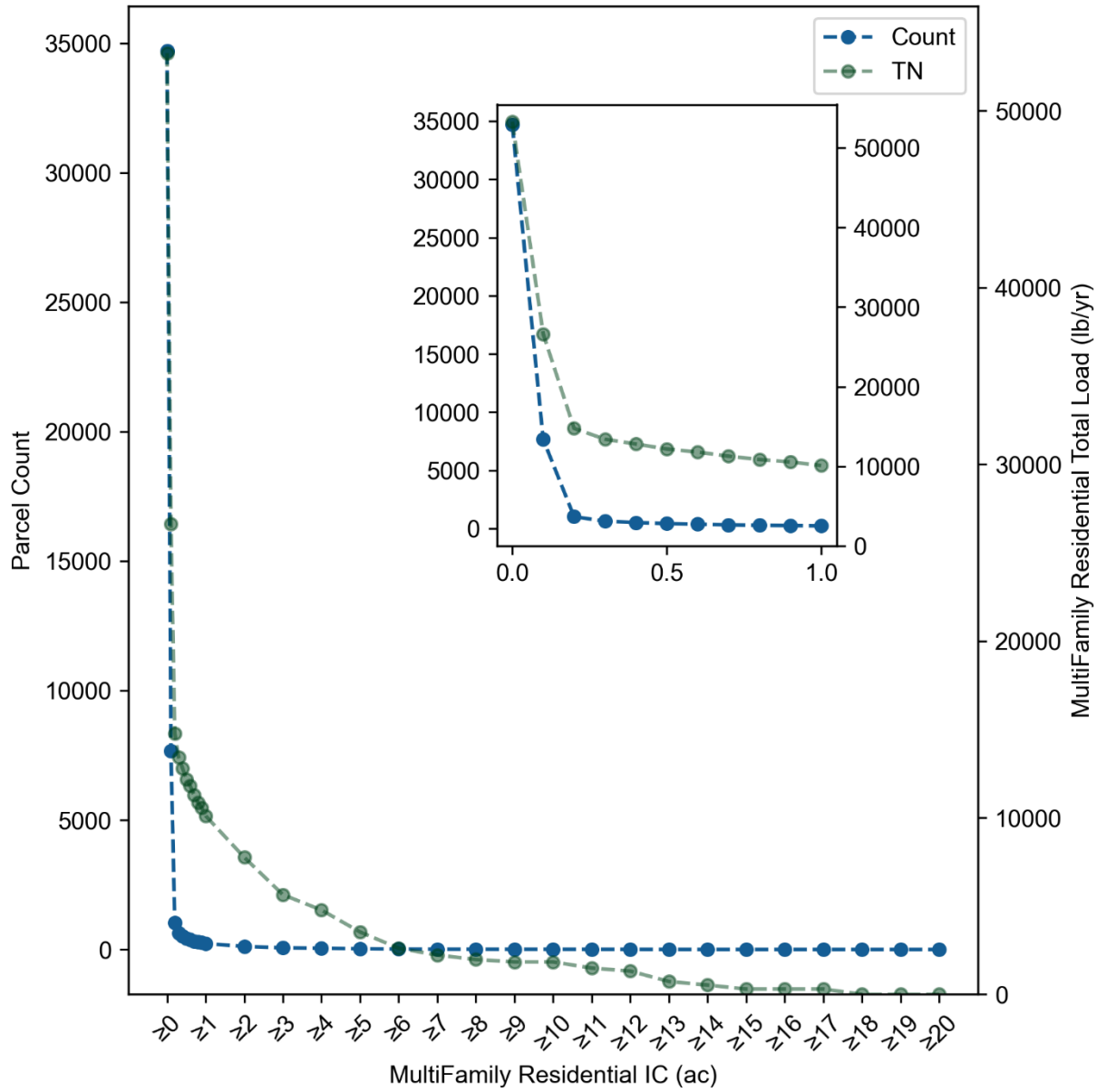


Figure B-8. Private multifamily residential parcel count and total TN load by parcel IC area. Note that a threshold of ≥ 0 ac IC includes all private multifamily residential parcels.