

Anaerobic Digestion Site Suitability Analysis

Background

Cooperative Energy, Recycling & Organics, or Cooperativa para Energía, Reciclaje, y Orgánicos (CERO) is a multicultural, worker-owned cooperative looking to site an Anaerobic Digestion (AD) facility that will generate dignified green jobs in Boston's low-income communities of color.

Anaerobic Digestion is a system of decomposing organic material, (food & yard waste) in an oxygen-deprived environment. The two results are biogas (comprised primarily of methane), which is used to generate heat or electricity, as well as a soil amendment.

Our four-member research team at UEP was tasked with providing CERO with a site suitability analysis to be used as they consider the location and feasibility of an urban AD facility.

This research took a broader, comprehensive approach to understanding AD siting criteria, both in the context of CERO's goals and in locating this facility in an urban setting.

The Table of Criteria below displays the siting criteria that were developed, the various metrics used, and at which step in the analysis they were applied.

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Criteria	Steps		
	GIS Filtration	Scenario Analyses & Imagery Evaluation	Ground Truth
Zoning	Excludes parcels not in an industrial zone		Does zoning appear consistent?
Geographic location	Excludes parcels outside of Dorchester, Roxbury, Mattapan and Hyde Park	Are parcels within 1/2 mile of Fairmount line?	
Flood zone	Excludes parcels in a flood zone		
Size	Excludes parcels that do not have 1/2 acre or more of undeveloped land	Do parcels have 1 acre or more of undeveloped land?	
Drinking water supply wells	Excludes parcels within 200 feet of drinking wells		
Commercial truck compatibility	Excludes parcels within 13 feet of water main sewer	Do the surrounding roads appear adequate for trucks?	
Buildings and use		Are there buildings on the parcel and do they appear in use?	What is the actual condition and appearance of buildings on the parcel?
Ownership		Who is the current owner? Is there potential for partnership in the future?	Are additional insights into the current owner?
Compatibility w/ abutting parcels		How are the surrounding parcels being used?	What are the surrounding uses?
Proximity to public transit	Excludes sites further than 1/4 mile from MBTA bus stops		What is nearby and what is the access and service level?
Proximity to waste generators	Are parcels closest to the greatest density of waste generators?		How much waste is available within 1/2 mile of the parcel?

Methods

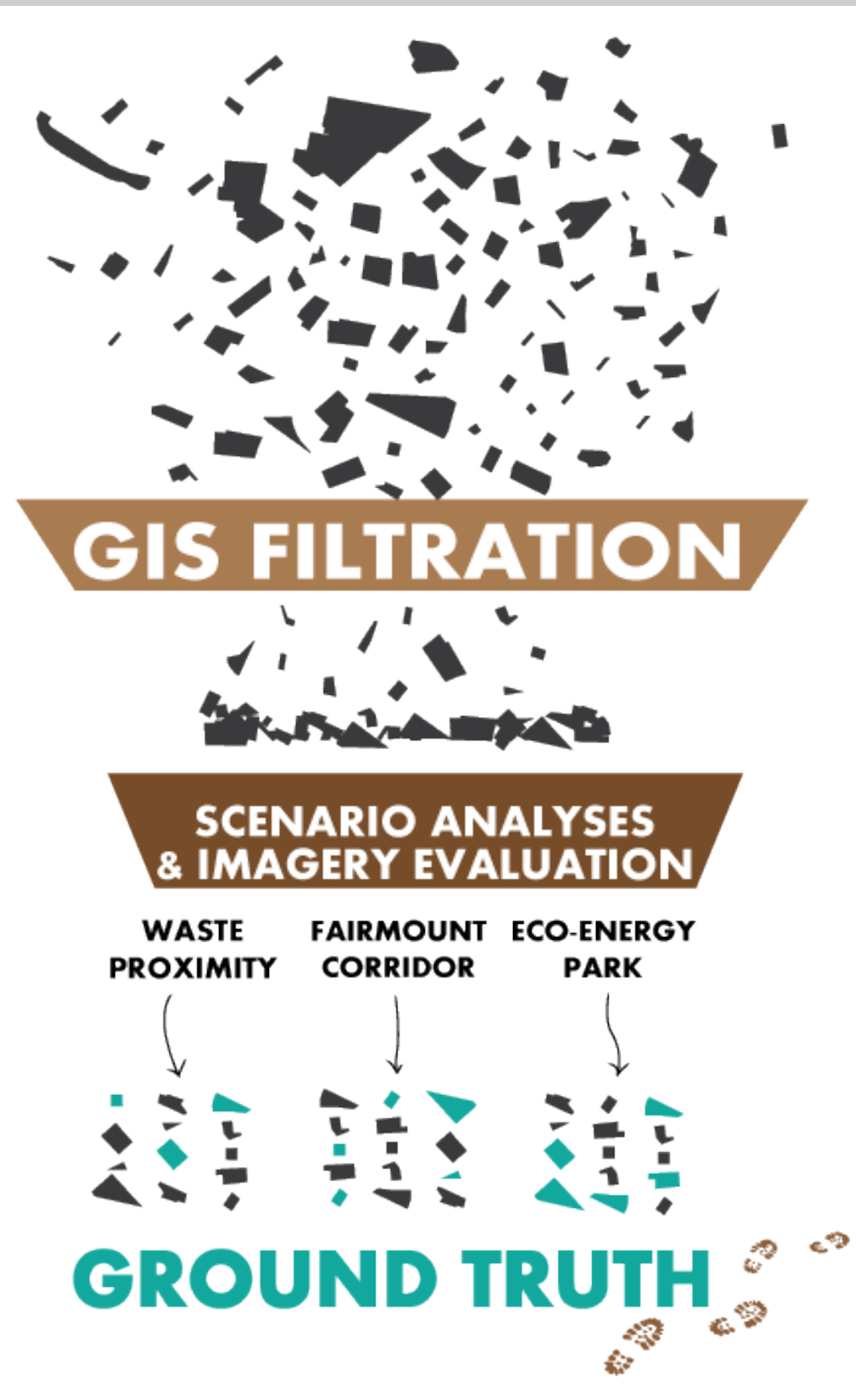
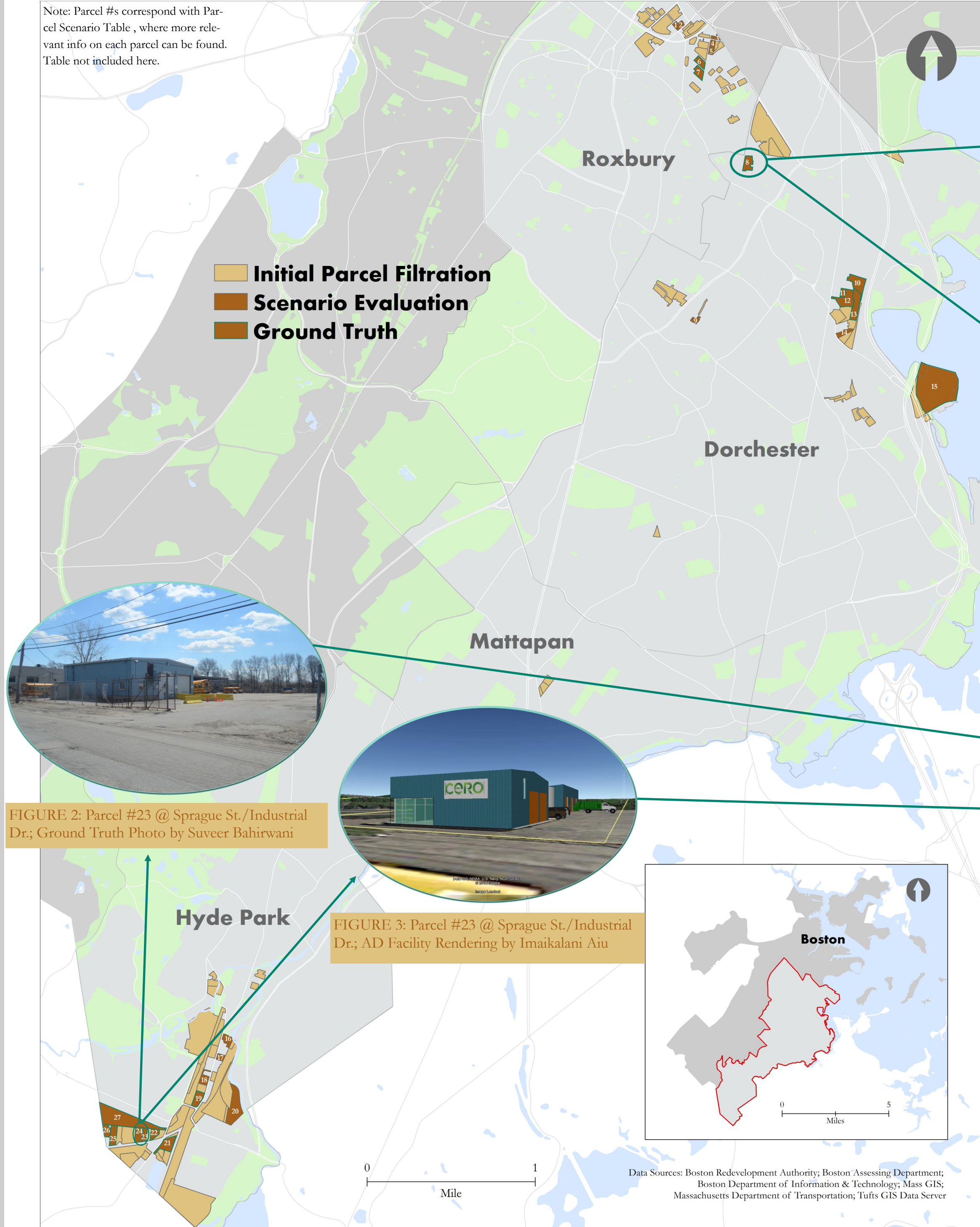


FIGURE 1: Applied Criteria Methods

The methods used to apply the criteria took the form of a three step process depicted in Figure 1 above.

The GIS filtration essentially applied criteria in the context of eliminating parcels that did not meet certain metrics. The scenario analyses and ortho-imagery evaluation organized the site selection, applied criteria in a more exploratory manner, and then selected sites within each scenario for their AD suitability. The ground truthing step was both a validation effort, with the purpose of confirming the results generated and observed in the previous steps, as well as an opportunity to further assess selected parcels for their suitability.

The maps below depict the AD site suitability of the three scenarios and the spatial distribution of parcels associated with them.



All data sources were assessed between Jan-14 and May-14 and include: Boston Redevelopment Authority; Boston Assessing Department; Boston Department of Information & Technology; Boston Department of Information & Technology, MassGIS; Massachusetts Department of Transportation; Tufts GIS Data Server. Projection: NAD_1983_StatePlane_Massachusetts_Mainland_FIPS_2001_Feet



FIGURE 4: Parcel #8 @ 65 East Cottage Street Ground Truth Photo by Suvcer Bahirwani



FIGURE 5: Parcel #8 @ 65 East Cottage Street AD Facility Rendering by Imaikalani Aiu



FIGURE 2: Parcel #23 @ Sprague St./Industrial Dr.; Ground Truth Photo by Suvcer Bahirwani



FIGURE 3: Parcel #23 @ Sprague St./Industrial Dr.; AD Facility Rendering by Imaikalani Aiu



Data Sources: Boston Redevelopment Authority; Boston Assessing Department; Boston Department of Information & Technology; MassGIS; Massachusetts Department of Transportation; Tufts GIS Data Server

Results

The initial GIS filtration step resulted in a selection of 115 parcels by eliminating parcels that are not in the study area; in an industrial zone;* without 1/2 acre of undeveloped land that is not in a flood zone; compatible w/ commercial trucks; within 1/4 mile of an MBTA bus stop; and at least 250 ft. from a public drinking supply well.

While this filtration created a reasonable universe of parcels to consider, it was too large a number to analyze further. The three separate scenario evaluations reduced these 115 parcels to a much more manageable selection of 27 parcels.

Waste - Here 13 parcels from Step 1 were selected based on their proximity to the greatest density of waste, concentrated in the northern portion of our study area.

Fairmount - In this scenario, only parcels that were located within 1/2 Euclidean distance of the proposed stops along the

Fairmount line were considered. The 18 parcels that resulted from this scenario were spread across our study in the neighborhoods of Roxbury, Dorchester, and Hyde Park.

EEP - This scenario yielded the most parcels with 19 remaining from the initial Step 1 results. Parcels were selected based on their undeveloped acreage as a proxy for future expansion potential.

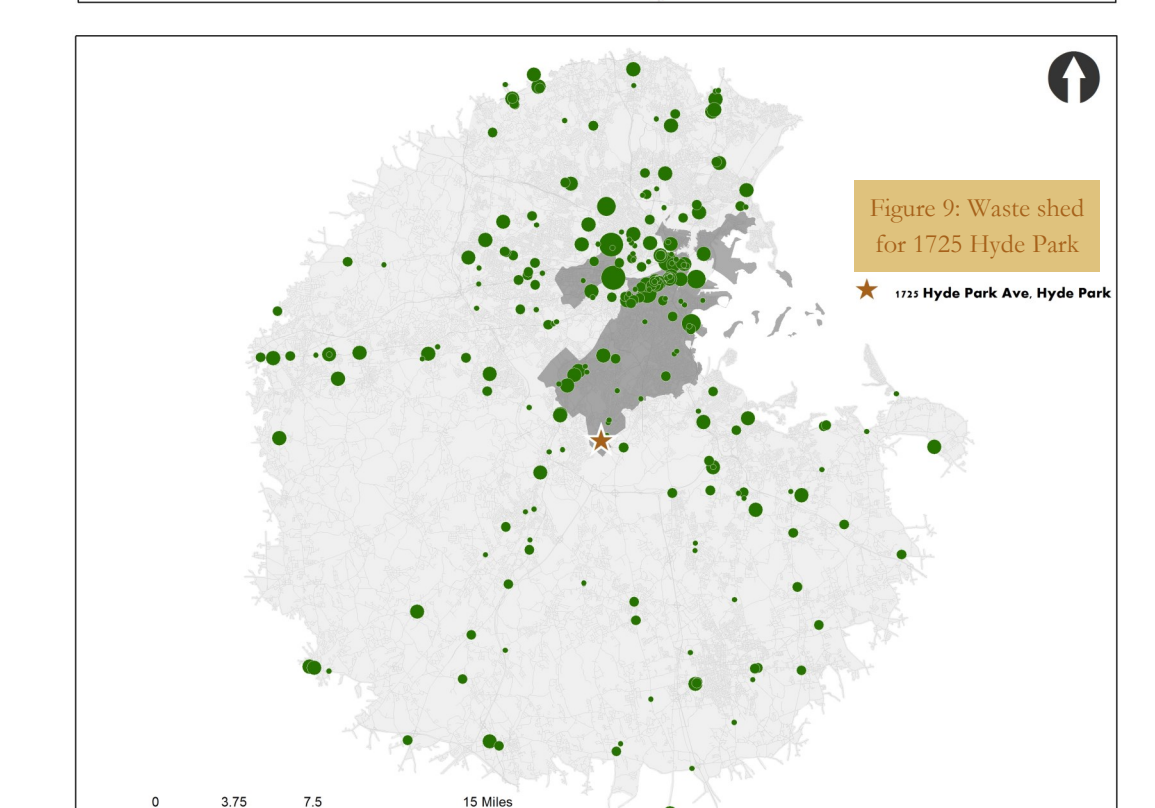
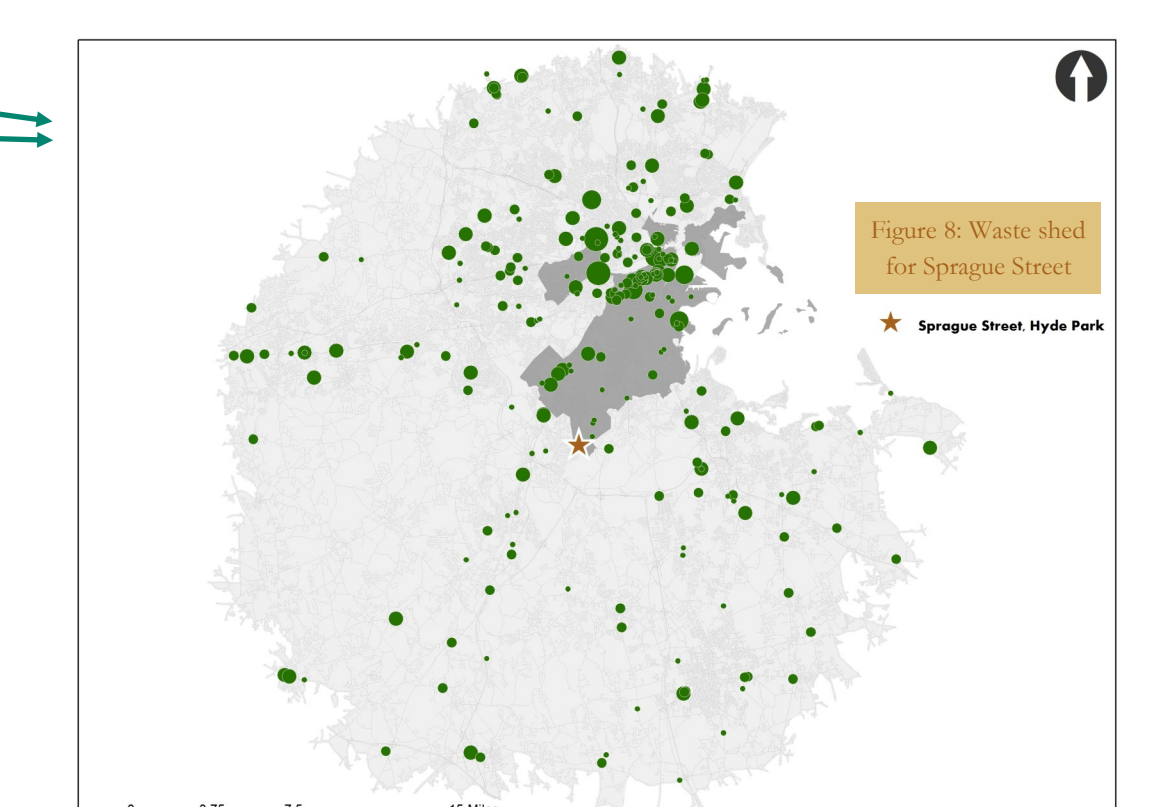
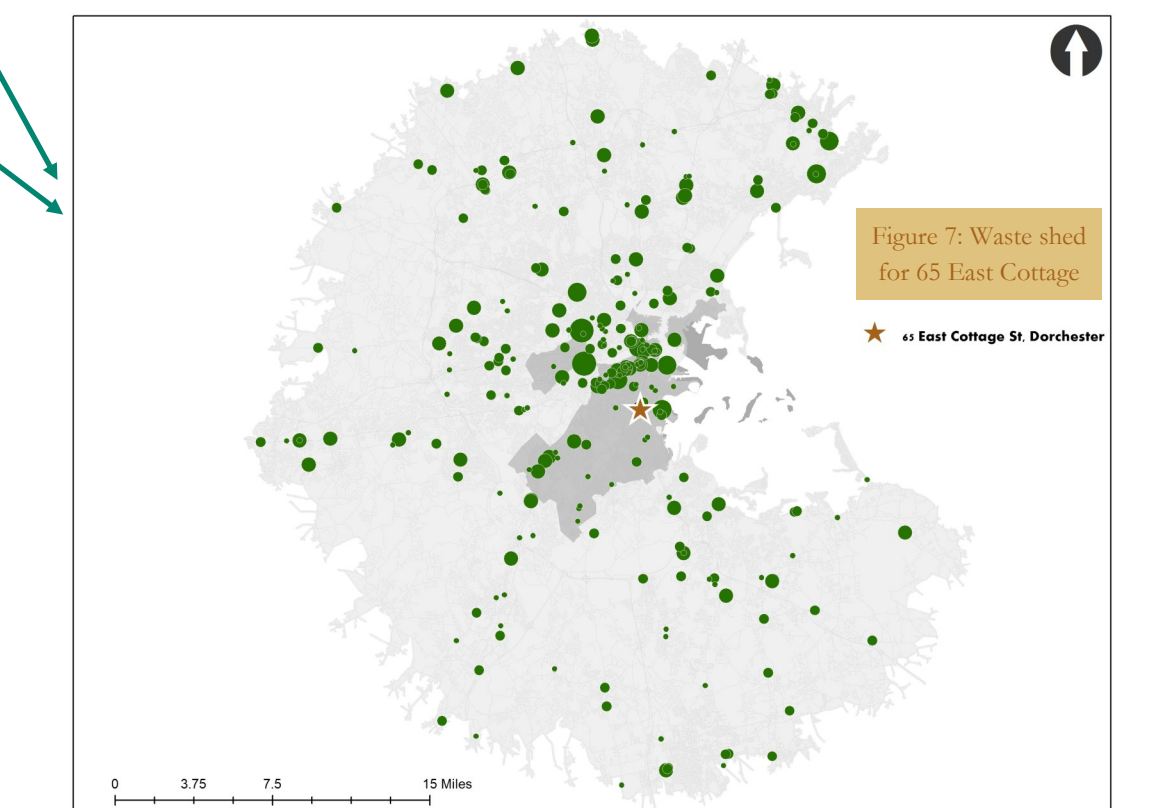
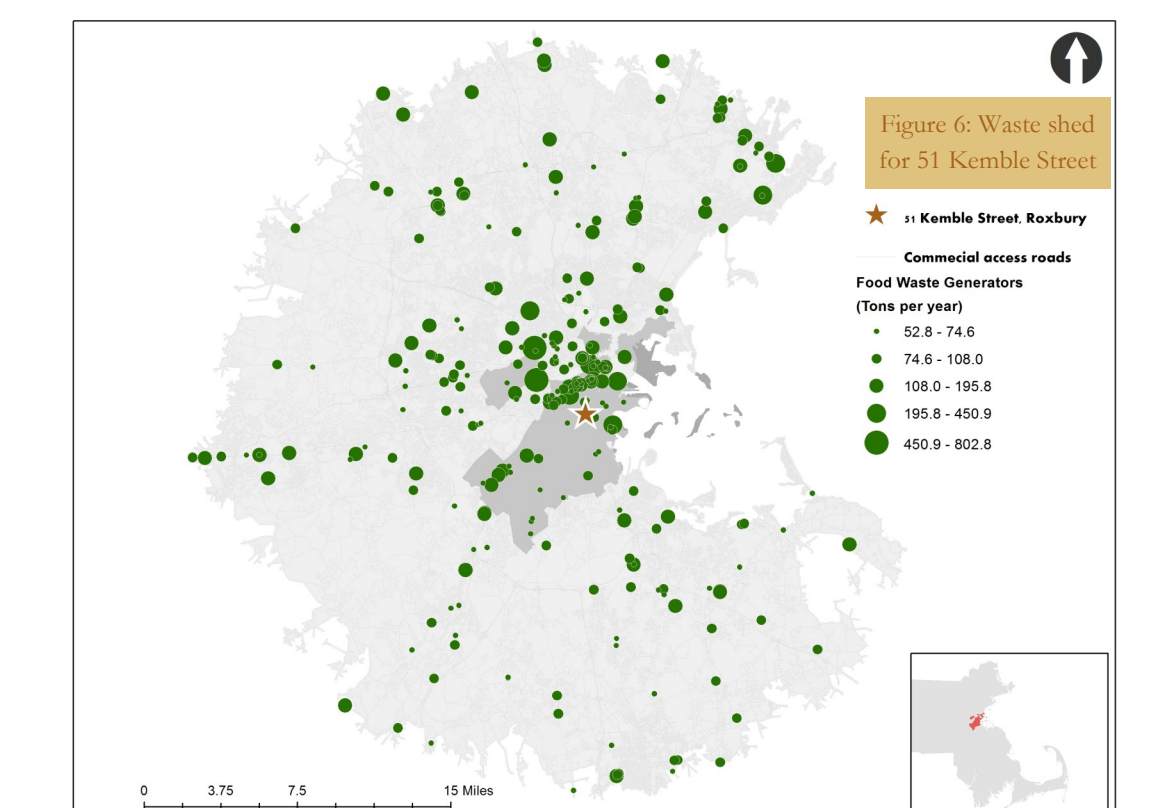
The ground truth results ran the spectrum from parcels being deemed unsuitable, to confirming a parcel as possible, to determining a parcel to have high potential. We visited 16 parcels of the 27 that suited one or more of the scenario analyses. Parcels were selected from each scenario to illustrate a broad spectrum of possibilities along the range of criteria.

Two of the high potential sites are depicted in Figures 2 and 4 above with an artist rendering of what an AD facility would look like at each site; photos of the actual sites are included in Figures 3 and 5 respectively. The top 4 high potential sites have their waste shed analyzed to the right.

It is important to note that this assessment does not intend to identify the most suitable site for an AD facility for CERO; rather it aims to develop and demonstrate the process applied to siting an urban AD facility.

* BRA note on Zoning Sub-District data layer used: The Zoning data is created and updated by the Office of Digital Cartography and GIS, Planning Department, Boston Redevelopment Authority. This data is updated on a monthly basis so the zoning information reported here may not reflect the most current legislation adopted by the Boston Zoning Commission. The signed Code Maps, enacted by the Boston Zoning Commission and available at the BRA, together with any amendments, remain the official Zoning documents. If discrepancies exist, the official signed Code Maps shall be considered correct. For further information regarding the Boston Zoning Code please consult Jeff Hampton, BRA

Waste Shed Analysis: 4 High Potential Sites



Figures 6-9 above depict a waste shed for the individual parcel highlighted. This waste shed was calculated as all estimated commercial food waste within a 20 mile driving distance. This amount is a modified conservative figure based on previous research done for the MassDEP. The soon to be instituted ban on commercially-generated food waste in MA has created the impetus for the development of AD systems and the focus on food waste.

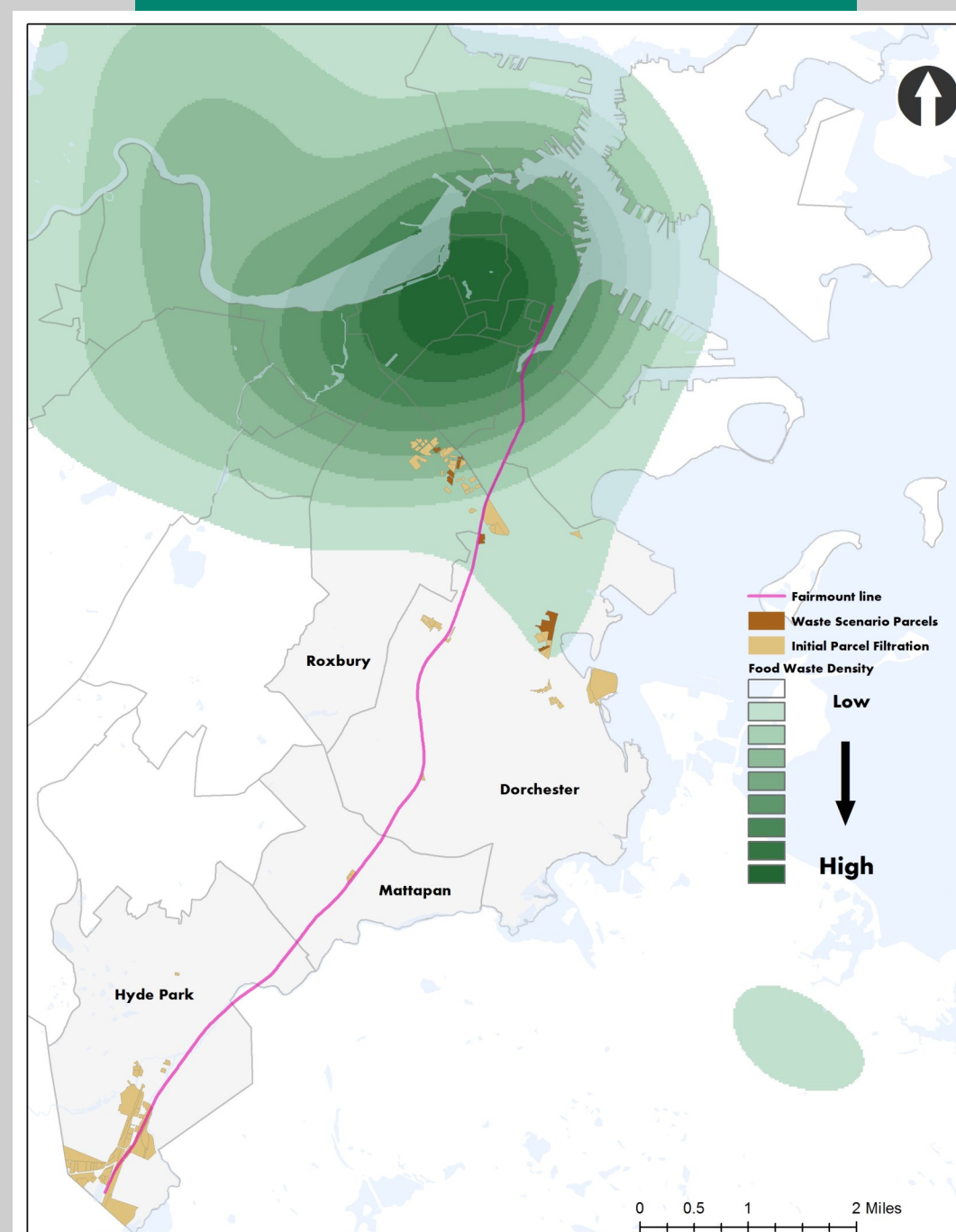


Uep Urban + Environmental Policy + Planning

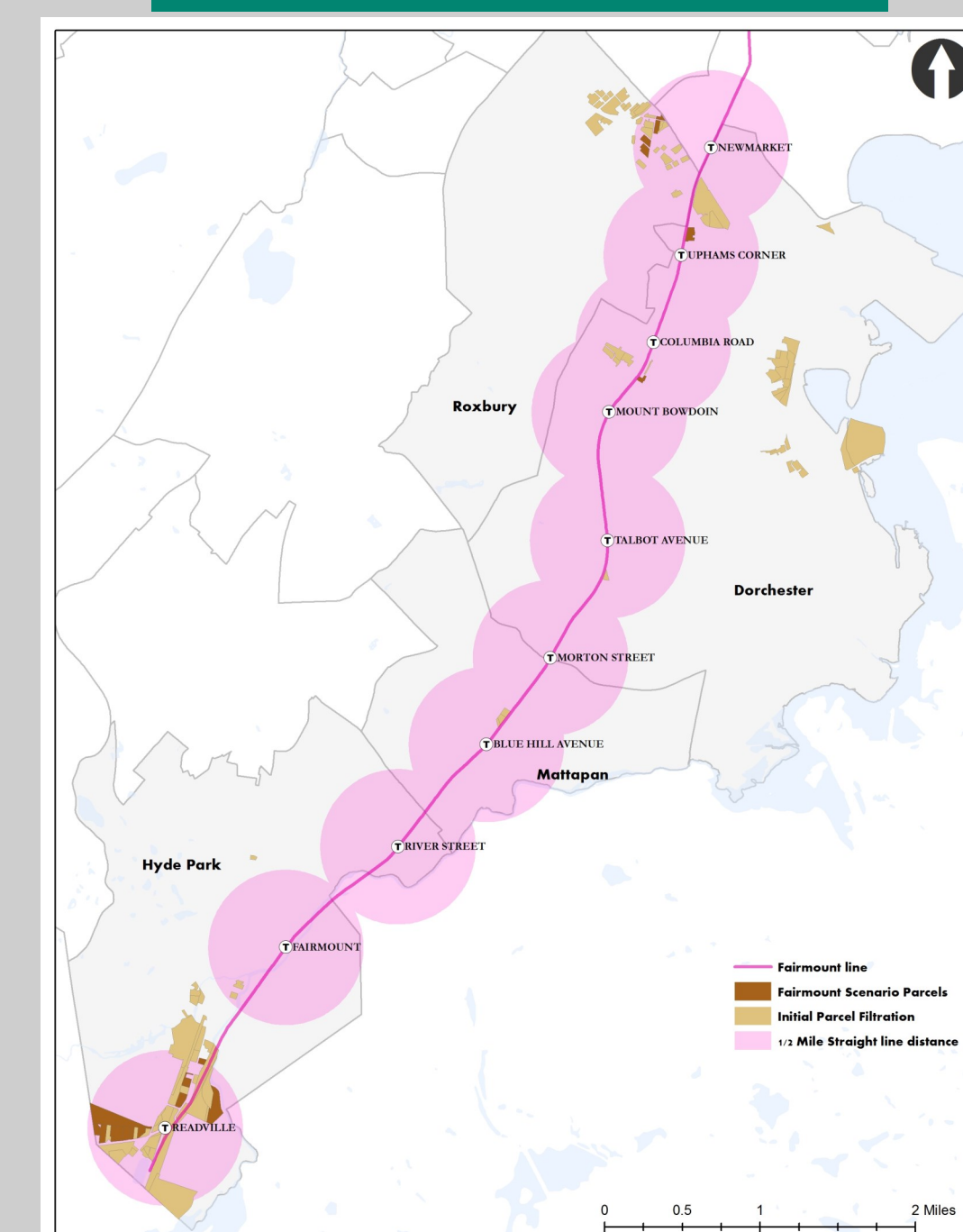
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Waste Proximity Scenario



Fairmount Corridor Scenario



Eco-Energy Park (EEP) Scenario

