The Boston Rat Action Plan
A Photographic Overview. *

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May 28, 2024

(*To accompany the written BRAP Final Report).

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Introduction

This photo report documents a two-day field assessment of selected areas of Boston neighborhoods that are representative of the whole based on complaint data, Inspectional Services Department input, and the various infrastructural elements of a city that are vulnerable to rat populations the world over.

Among the multiple goals of Mayor Wu's BRAP program, a strong point is to enhance through the BRAP as strong an environmentally-sensitive Rodent IPM program as possible while at the same time aiming for the goal of a *sustainable reduction* in the current burgeoning population.

Recommendations towards these objectives are provided in both the photo and written reports.

Boston Rat Action Plan : Neighborhoods and Infrastructures Assessed
March 2024

There are 22 neighborhoods of Boston. The objective of this BRAP project was not to characterize each neighborhood but in the hopes of project efficiency to statistically select and assess those areas of the city that are representative of the neighborhoods that have filed multiple rat complaints.
Relative to urban rats and their uses of cities, a commercial strip (or park, alleyway) in Allston will be similar to the same in Chinatown, or Dorchester, Roxbury, etc., regarding the presence or absence of urban conditions that are causative and/or conducive to the attraction, development, magnitude, and sustainability of that neighborhood's rat population.

Boston Rat Action Plan : Selected Neighborhoods and Infrastructures Assessed March 2024

1. Boston Commons and Public Gardens
2. North End Assessment and Area Pocket Parks
3. Boston Water and Sewer Collaboration : Sewer rat evaluations of North End Sewers and South Boston Reserve Channel.
4. Boston Housing Authority Visits
    a. Charlestown BHA
    b. Cathedral BHA
    c. Mary Ellen BHA
5. Allston Neighborhood Area Assessment on Trash Day
6. Ringer Park Rat Assessment
7. Department of Public Works tour
    a. Several downtown neighborhoods and multiple alleys to assess residential trash practices and operations
8. Back Bay Neighborhood and Alley Assessments: (start: Commonwealth / Exeter Street)
9. Roxbury Neighborhood Walk Through
10. Haymarket Area Assessment
11. Downtown Public streets and alleys and James Michael Curley Park.
12. Cursory visit to Newmarket Square industrial park.

Photo Report Organization

Section 1: An Overview of the Boston Rat Issue

Section 2: Neighborhood Rats

Section 2a Residential: SFRs and MFH apartments.

Section 2b Commercial: (Stores and Eateries)

Section 2c City-Managed Properties

(1) Boston Housing Authority

(2) Schools and playgrounds

(3) Parks and Tourist Centers

(4) Sewer Rat Issues

Section 3: Rat Damage to Boston's Infrastructures and Properties:

Section 4: The *Potential* for Rat Dispersals Associated with Demolitions and Major Construction Programs.

Section 5: Enhancing Boston's Rat Integrated Pest Management Approach via the Boston Rat Action Plan.

5a. Early detection and intervention of rat colonies and populations via the use of remote rodent sensor technology.

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Section 1.

An Overview of the Boston Rat Problem.

An Overview of the Boston Rat Problem

Along with the other Eastern Megalopolises, Boston too is a highly rat-vulnerable American city. Some of the reasons of this complex biological problem include:

1. Boston is a seaport city. Rats originally colonized Boston in the early 1700s via ships from Europe and other parts of the globe, and such ships continued year upon year into the many thousands leading up to current day.
2. Within Boston there exist hundreds of rat-preferred alleys, street nooks, and a 150-year-old sewer systems. All result in a "perfect-storm city" for rats.
3. As an old city, with century-entrenched rat populations, it becomes exceedingly difficult to get populations back down to a 'tolerable thresholds' for urbanites.
4. With densely populated cities as per above, comes copious food refuse in all directions (as illustrated in this report). Food refuse is the No. 1 driver for rat populations in urban environments.
5. Finally, rarely does the market for professional rat control services rise to the level it would take to achieve 100% elimination of a rat presence on any city or private property to achieve true sustainable control. Consequently, "rat-rebounds" following extermination efforts have been on-going in most US cities since the rat's arrival to America centuries earlier.

Figure 1. The Norway rat: Boston's only urban rat species. Arrived in Boston late 18th Century. Also referred to as the sewer rat and the brown rat— very apropos titles considering its behavior in cities and color.

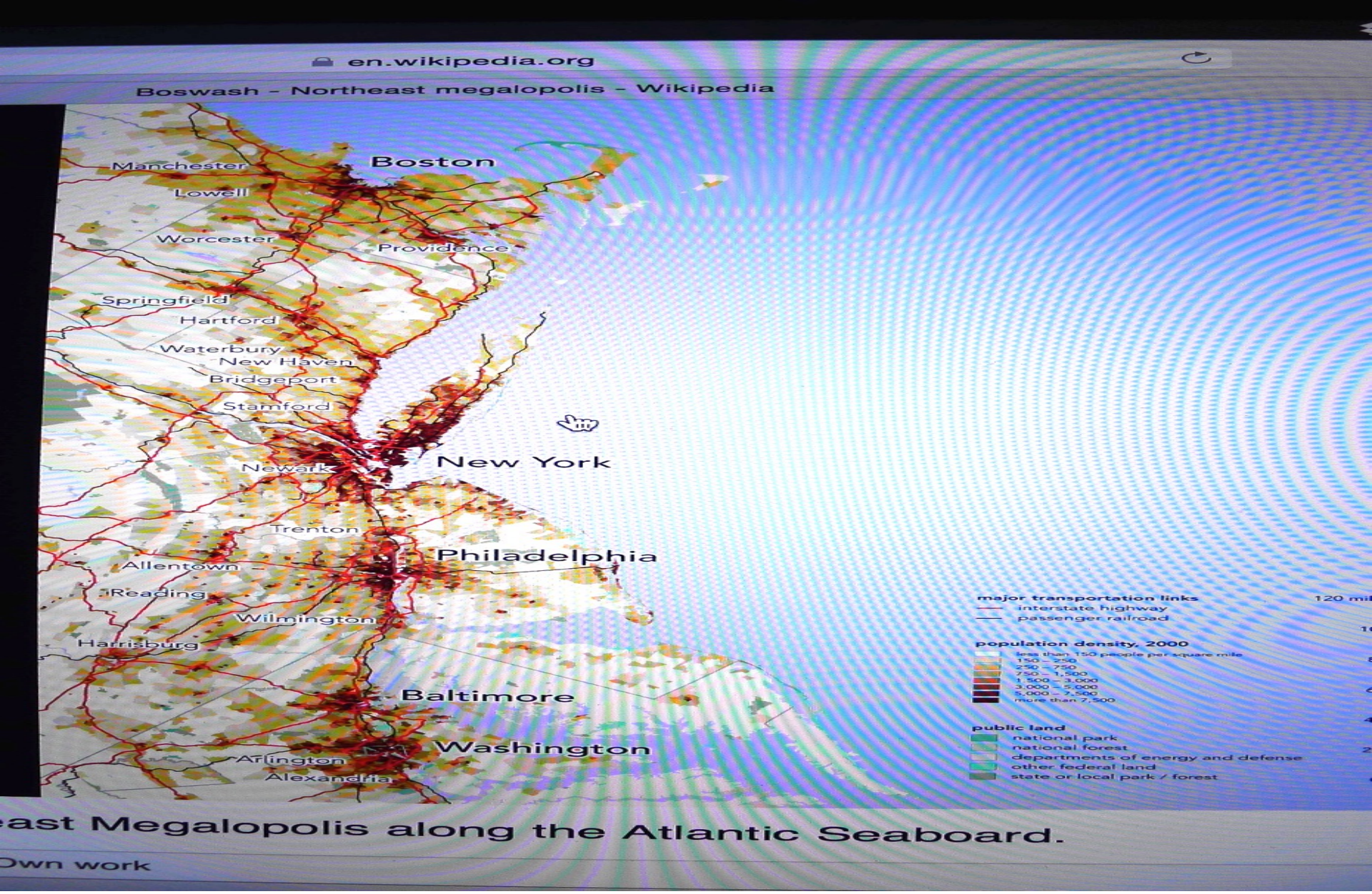


Figure 2. Boston is not alone in its war against rats. East coast cities from Portland ME, South to Williamsburg VA (the Eastern Megalopolis) have all experienced significant rat population increases over the past decade.

Figure 3. In older neighborhoods (e.g., Boston's North End), rats can exist in everyday street scenes but largely remain invisible to the public and even to many residents during the daylight hours. Rats occupy the shadows of nearby alleyways (e.g., Fig. 4), and inaccessible sub–surface sidewalk crannies, sewers and street burrows. Should they invade interior spaces they will occupy both interior horizonal and vertical voids (walls, floors, ceilings—blue arrows) from the roof to the basement.

Figure 4. Boston is a city with many alleys –a key urban feature that benefits rats significantly. Shadowy, protected spaces with old passageways above and below roads and sidewalk surfaces, and food waste in one form or another is never more than a few yards away on most nights of the week.

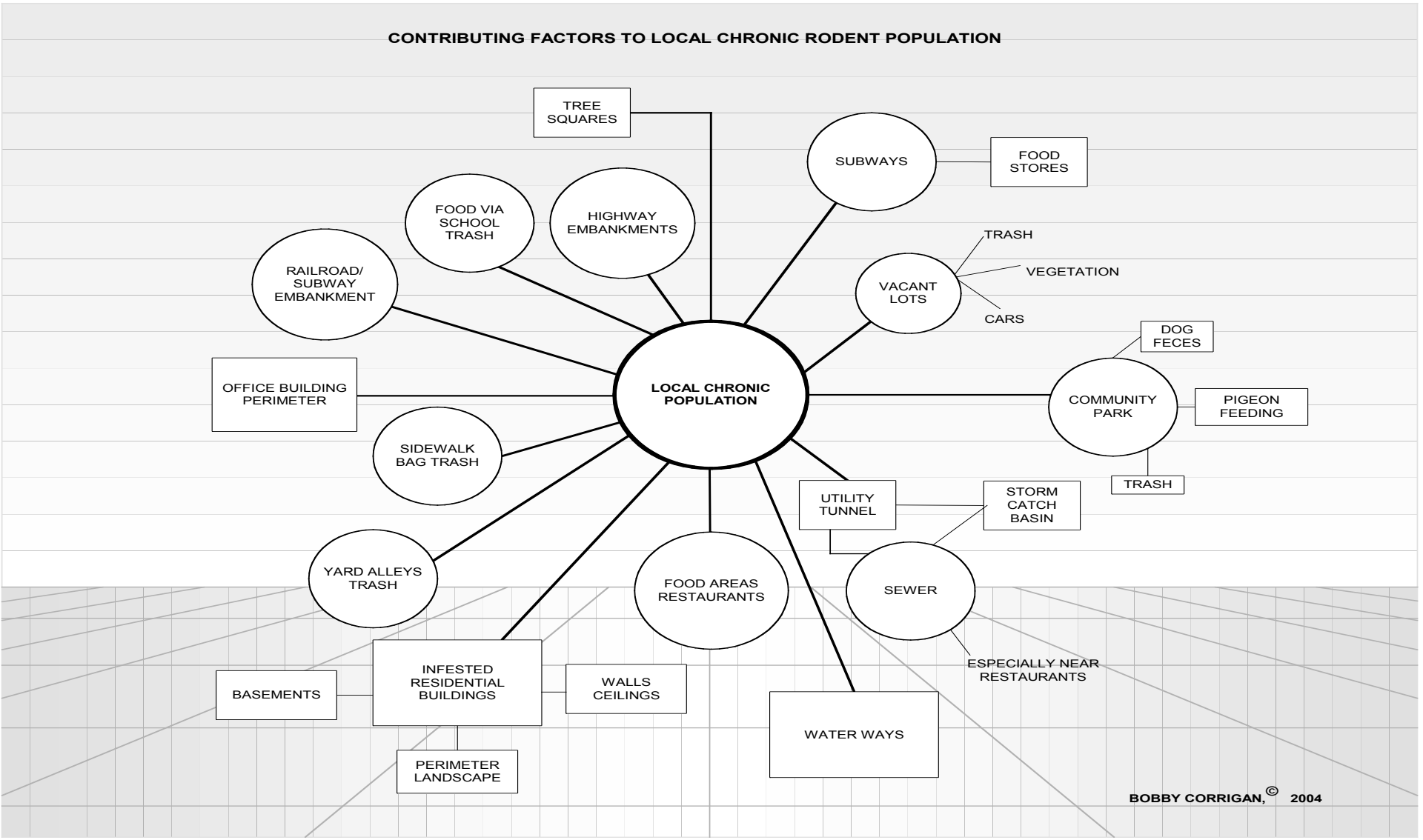


Figure 5. A diagrammatic sketch depicting the various sources and infrastructures that may contribute to the presence of rats in nearly any Boston neighborhood. Most of these interconnected city components are covered in this photo report. It cannot be emphasized enough by BRAP that city rat management programs demand corresponding collaborations among City Departments and the involvement of all citizens in all residential and businesses sectors.

Section 2
Neighborhood Rats

2a: Residential: Single Family (SFR) and Multiple Family (Apartment Buildings).

Figure 6. In residential area rat management, the frustrations can run high. Everybody is connected “at the hip” to their neighbors. And rats of course do not observe property lines and fences. Here there are at least four separate yards from which one typical family of 15 rats have a choice to forage over every night; some of the family going in one direction, some in the opposite direction giving the impression to all whom live here that “there are rats everyplace and the city must do something!!”

Figure 7. The backyard bordering Ringer Park in Allston. Abundant food for rats. It only takes one house on a block of 10 clean yards to cause rats for the entire block (or in this case, rat problems for Ringer Park on the immediate other side of the fence). See additional Figures of similar messy yards with evidence of rat activity.

Figure 8. Another unkempt SFR yard with bad refuse practices. The property owner apparently believes paying an exterminator for many bait boxes is the solution vs. simply addressing the sloppy garbage cans and uncleaned bar-b-ques of the yard that attracted the rats in the first place and allowed them to reproduce.

Figure 9. It was common to sight residential properties of Roxbury with severe rat infestations. Note this yard and the sidewalk (and the multiple bait stations trying to fight off the rats). The rats have burrows already constructed beneath the new asphalt (red arrow). How much of this entire new asphalt sidewalk is due to previous rat burrowing/destruction? (Also see Figures 78-79).

Figures 10-13. In a nutshell, the management of the rats in any Boston alley supporting residential properties can all be summed up within such three "spots" are seen here. Good research has repeatedly proven that poison bait boxes placed all through the alley will not have any significant impact on reducing the rats of this alley if food trash occurs regularly during a week. Achieving sustainable control of a city's rats has always been an environmental thrust, not a pesticidal band-aid thrust.

Figure 11. Despite the unrelenting hard hard work of the Boston Public Works professionals, there will always be city residents who pay no mind to proper trash disposal practices. Rat populations explode in such environments and constantly disperse to areas nearby that are unoccupied with rats, causing new infestations to eventually spread throughout the entire city as the decades pass by.

Figure 12. A modern-day city conundrum. Plastic bags are convenient and expedient to collect for sanitation professionals for sure. But this refuse collection convention has the obvious consequences of feeding and growing rat populations. There is no offsetting the predictable rat increases with exterminations and poison baiting's. After five decades of using plastic garbage bags as approved “garbage containers” and experiencing the resultant rats, New York City passed containerization laws that eliminates all plastic bags used in this manner for residential and commercial entities by the end of 2024.

Figure 13. Unaccounted for refuse placements in willy-nilly spots by discourteous citizens. An all-too-common sight throughout many areas the BRAP team visited over two days. The holes in the bags are classic rat holes (an immediate confirmation that rats live in the surrounding alley, yard, park, etc.). These bags were very likely dropped here during the previous night. Consequently, rats can feed all night long leaving the spill and mess seen here.

Figure 14. A residential yard in Boston, affiliated with the BHA extension during the March 7 neighborhood survey. This is a very active, severe infestation of breeding rats directly next to the home's foundation. Notice the bikes indicating children live in the dwelling. Usually when rat burrows are this extensive, it indicates that food is available to the rats (or they have made it available (see next figure) within a 25-50 ft. radius as is the case here.

Figure 15. Second to plastic bags left on curbs, the residential cheap plastic garbage cans (CPGCs) are a major contributor to a neighborhood's rat population. Within the span of less than one hour at night rats, can gnaw through these cans. Once through, lids or not, the hole is the portal to the rat's nightly meals. This can was adjacent to the severe infestation of a neighbor's property shown in the previous figure.

Figures 16. An almost A+ maintained residential Boston MFH property. See Figure 17.

Figure 17. Within the communal residential yard space from previous figure. Despite how clean the yard may be maintained in Figure 16, if food trash bags are casually left about and/or pulled and left for later collection, rats will discovery this easy feeding spot and constantly attempt to locate their nests on the property. On both trash days and non, trash days, this scenario was widely noted during the two-day BRAP city assessment in residential, city-owned and commercial sectors. Boston's rats simply do not have to forage far to find the nutrition needed for their reproductive output. Rats were tearing into this bag in the front and back. Note the poison bait box back in the corner under the bush. That rodenticide box could never out-compete this litter basket's regular food and dog waste that's offered to the local rats.

Figures 18. A private property apartment building in Boston. Dumpsters are a major player in any city's rat management programs. (See written report). Many residents and business employees "***throw***" food trash into the dumpsters vs. **placing** the trash into the dumpster. The 'throws' often miss, or the bags break and leak all over the outside of the dumpster drawing rats on a 24/7/365 basis. Dumpsters of all types must be carefully managed: "messy areas must be kept clean" and City Code Rules play an important role in such. These dumpsters at this time were relatively low in refuse. But note the very heavy grease stains at the bases and the poor condition of the rain guards, etc.

Figure 19. On the back side of the alcove retainer wall from the previous figure. When food is nearby, rats try to build their rat burrows and nests (circle) as close to the food as possible. On the other side of this retainer wall (arrow) at a private property Boston apartment complex, is a messy dumpster area with abundant spillage. Worth noting the rats have destroyed and denuded the landscaping here via their burrowing activity.

Figure 20. Apartment building dumpsters are a major player in any city's rat management programs. (See written report). Many residents / business employees "throw" food trash into the dumpsters vs. placing the trash into the dumpster. This photo was taken early in the morning (8 AM). (I.e., the rats are gorging each night here). The result is a very fast population increase of the rats which is shown in the photos below because these dumpsters are on the periphery of Ringer Park (Figures 57-61). Such rat scenarios then spill further out over the park and onto the park's nearby SFRs /MFR neighbors (only about 50 yds away).

Section 2
Neighborhood Rats

2b: Commercial Zones

Stores and Eateries, Haymarket and Newmarket Square

Figure 21. In tourist zones (especially near the Haymarket), it is to be expected the “front of the house” will be maintained and look clean and free of ugly refuse. But to control rats in any city, all areas must be clean and orderly **around “all sides of the house”.** To keep a city rat free, all alleyways and refuse alcove areas (orange star) must be kept clean. Good refuse practices pays off 100x more so than the line of rat poison bait boxes seen along the wall here (red arrows).

Figures 22-24. The Morton Street" Alley of North End. Alleys are prevalent throughout many areas surrounding the downtown neighborhoods of Boston. The BRAP team found the alleys assessed over the two days ranged from clean & tidy to an extreme opposite as seen in here. Because of the abundance of commercial food waste improperly managed, rat burrows were abundant on both sides of the alley from one end of this alley to the other (red arrows). Note the children's playground (green arrow) in direct proximity to the alley and the heavy rat presence. Fortunately, this playground was closed for upgrades.

Figures 23. A close-up of the situation shown in Morton Alley in Figure 22. Very active rat burrows as of March 6, 2024. Note the structural damage to the sidewalks and curbing from the rats excavating all of the sidewalk's supporting fill. Because rainwater can now infiltrate these spaces, created by the rats, an overall deterioration occurs to the sidewalks (tripping hazards) alley street (pothole development), foundations walls, and basements, as well as to the associated sewer laterals and connectors. Boston city coda and individual property responsibilities needs to be urgently reviewed to prevent such scenarios from falling into an ambiguous status as to 'who' exactly is responsible for 'what'. If not, rats will successfully breed here and spread in every direction for blocks in this area (as seen in previous Figure).

Figure 24. Part of the BRAP field assessment team taking notes of actions-to-be-taken to clean up this rat-infested alley that is so close to busy tourist- pedestrian streets, shops, and eateries.

Figures 25. The back of a commercial eatery in Allston, MA. Deplorable sanitation conditions that will draw and grow rats for not only the restaurant (food safety) property itself, but for the community. Under such conditions, having a regular ‘pest control service’ for a commercial restaurant, or bakery, or café, etc., accomplishes little to nothing relative to controlling rats. The residential neighbors only 40 feet away through a fence will be “victims” of the commercial property’s mistakes and rat magnet.
See written report for additional discussion.

Figure 26. An alleyway in a commercial downtown sector of Boston. Grease refuse is very attractive to both attracting rats and providing them with ”nutritional” (rats want and need high fatty content). This rat poison box ***is of little to no protection in this*** specific location. Research has proven rats (and mice) disregard these boxes altogether when the foods they “grew up on” such as grease spills, food garbage, etc. remain as before. When strict sanitation code and adherence to such code be in place subsequently eliminating all garbage-related foods, then rats consume the baits—and thus achieving preventive control. (Rain drop blurring).

Haymarket

Figure 27. Online photo. Obviously, the outdoor public markets of cities and towns are any pest's dream come true (flies, roaches, mice, rats, birds). The food drops and fragments of the foods as they are handled results in "food shrapnel". See Figures 28-37.

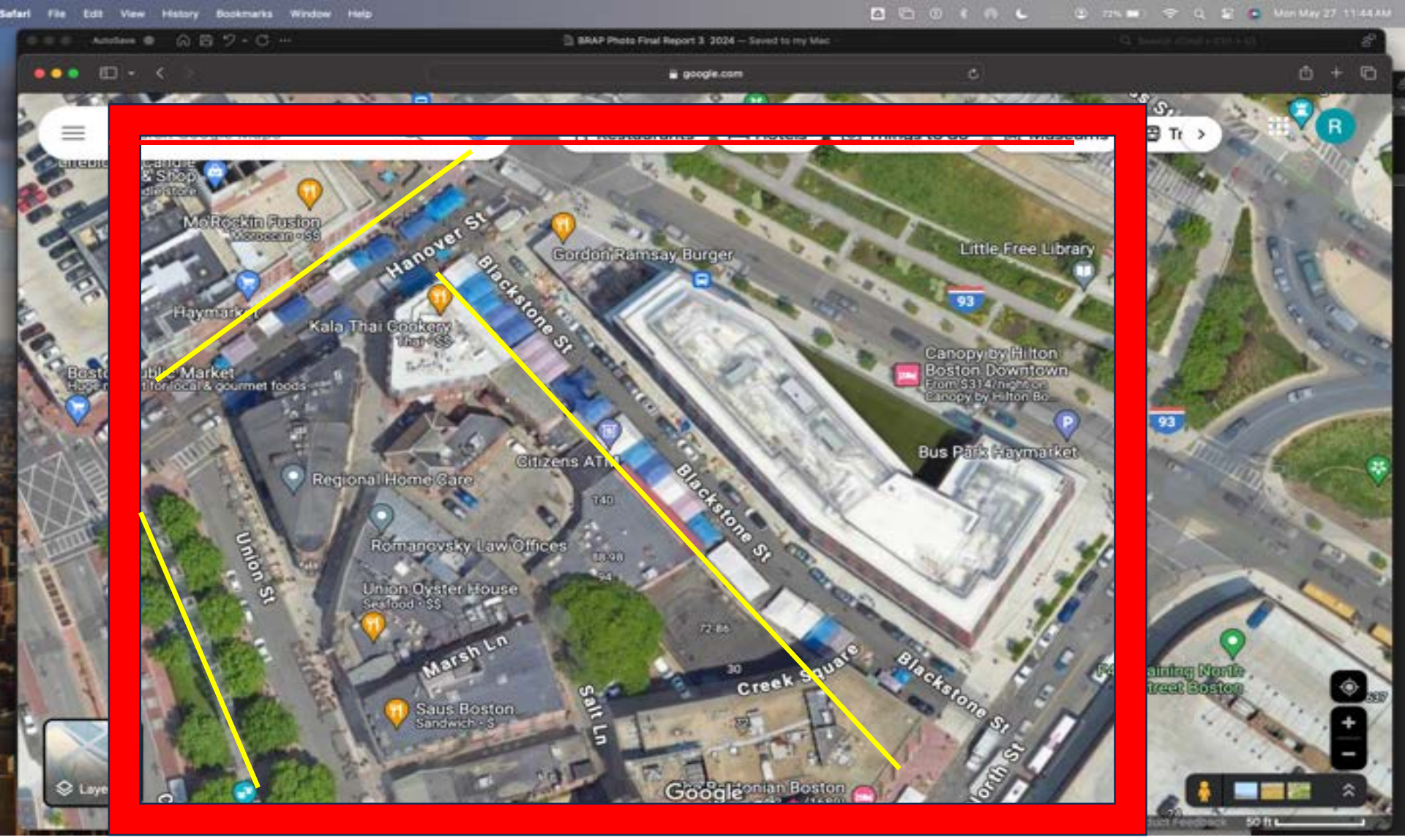


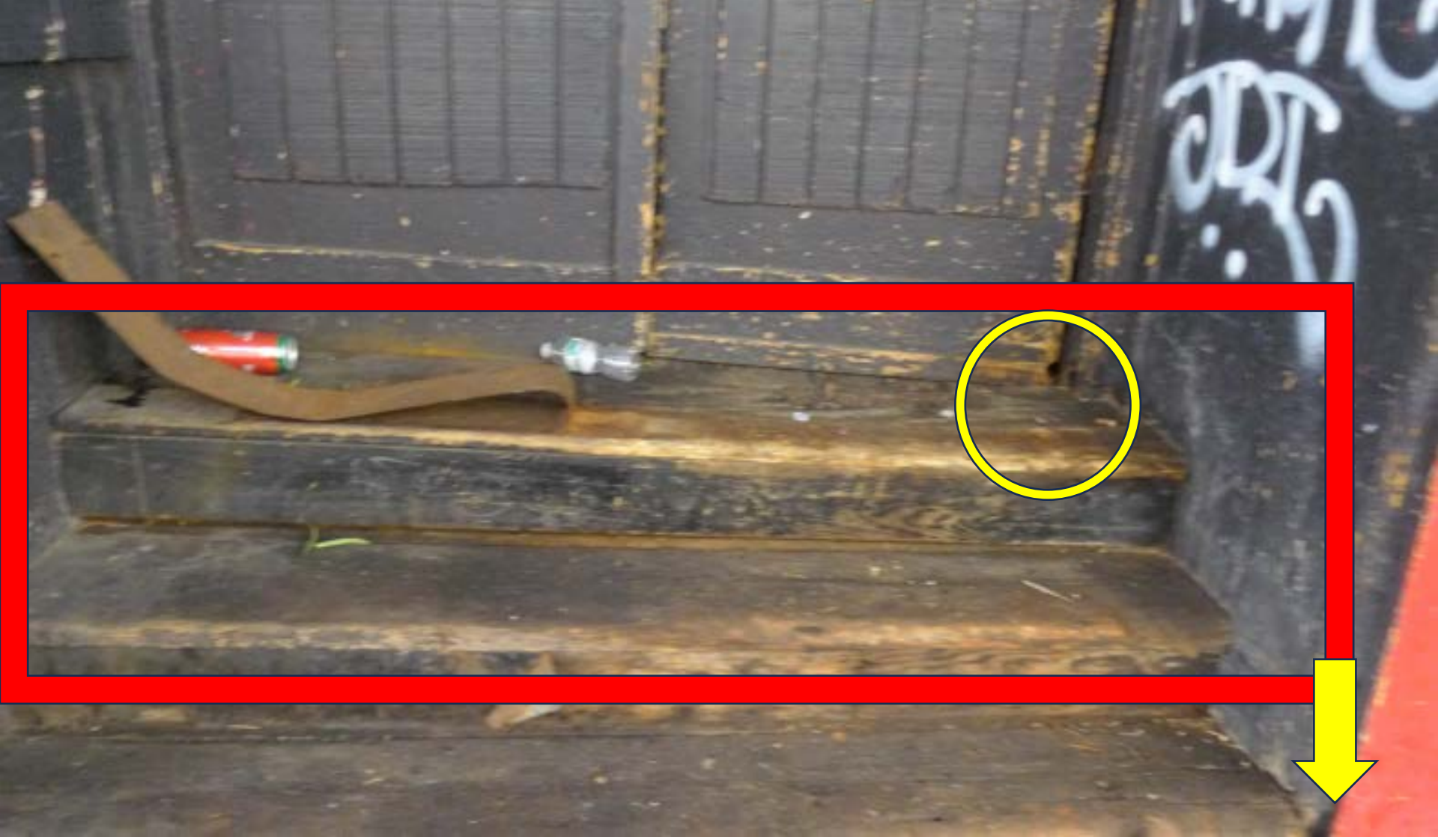
Figure 28. The Haymarket Downtown Area of Boston. A critical area for ensuring all rat inspection operations and monitoring technology occur in this zone. The yellow lines represent the most rat vulnerable areas. But so too, must all alleys and street nooks that exist within this red box because the popular restaurants of the Haymarket area will generate copious amounts of food waste.

Figures 29-35. It is paramount that the entire stretch of older buildings and streets along Blackstone Street and Hanover Streets are in good repair. Otherwise, rats will live below the Haymarket and emerge during the quiet hours of the night. Additionally, all door bases and general foundational construction must be rodent proofed to prevent rats from harboring within a basement or ground level building cavity voids. Figure 28 depict the zones needing attention. During the BRAP field assessment, it was common to encounter buildings very vulnerable to easy rat invasion. A contracted pest control vendor cannot correct for such rat infestations via rat poison boxes.

Figures 30-32. Boston's Haymarket area, although mostly closed during the BRAP visit it was assessed for rat presence and any causative conditions. Because the Market exists in a rat-active area of the city and will emit copious meat and fish odors during the operating months *exceptional refuse practices via complete removal of all food garbage from the site before night fall and cleaning after each market day are critical to preventing very serious rat infestations into this important tourist area of the city*. All holes (yellow circle) into the street should be assessed by ISD as to being rat-affiliated or not. **The entire area within the red box of Figure 28 is a critical rat prevention zone.**

Figure 31. A very active rat burrow beneath a sidewalk in downtown Boston close to the Haymarket. Rats will completely undermine an old city's heavy granite slabs causing them to collapse and be replaced with a much less sturdy infrastructure of asphalt in addition to being much less aesthetically pleasing to the charm of old historical neighborhoods of the city. See Figures 32-35 for further discussion on the importance of keeping up with such repairs.

Figure 32. The importance of rodent proofing to avoid expensive city repairs. Note the mix-mash of sidewalk elements over time. All this patchiness creates many interstitials spaces for the burrowing rat—especially in areas where food odors and food drops, fragmentation of food , etc. is so highly pervasive as in the Haymarket. All such sidewalks must be examined expansion-joint-by-expansion-joint for integrity and to ensure the correct sealants are used to to deny rats entry to the sub-surface creating additional voids that will need patches and expensive repairs (red repairs)



Figures 33-35. All old properties of Blackstone and Hanover Streets must be rendered rodent proof. Doors and wooden stoops such as this and where the food vendor tents are set up will certainly offer foraging rats great harborage inside the buildings and /or within the wooden void of the stairsteps (yellow arrow). The yellow circle depicts a classic hole gnawed by a rodent to gain entry sometime no doubt long ago.

Figure 34. In addition to the rat proofing of the sidewalks, all doors all along the Haymarket neighborhood must be rodent-proofed, otherwise rats will move indoors and live in walls but forage outdoors during market days and nights. There are professional-level door seals that should be installed on each of these doors. (e.g., www. Xcluder.com).

Figure 35. Door thresholds spaces are the No. 1 means by which rats and mice enter buildings. But the great majority of doors surveyed during the BRAP field days were found to not contain any rodent proofing at all (vs. a high abundance of poison bait boxes always near by). Poison bait boxes cannot correct for this entry and not prevent any protection from rodents from entering. For all buildings, but especially for all city buildings (e.g., Boston schools, Housing Authority, city office buildings, etc.), it is both elementary and essential for door thresholds to be properly rodent proofed at the bases. Professional level rodent door sweeps are not expensive investments for a city infrastructure and are readily available on-line through quality vendors (e.g., www. Xcluder.com).

Figure 36. Along Union Street within the Haymarket Zone. All areas around and back of all shops and the side alleys within the Haymarket area of downtown Boston must be under a careful “rat watch” during each month of the year. Refer to written report for additional recommendations.

Figure 37. As per the discussion in Figures 90-94, remote rat monitor technology can be essential for rat prevention in areas such as the Haymarket. Think of such technology as electronic “canaries in a coal mine”. Otherwise, the city will need to depend upon the periodical inspections of city inspectors as well as hiring private pest contractors to install, inspect and service multiples of bait stations and the time to inspect and re-inspect and re-inspect the same areas every other week. Integrating remote sensor technology into the management of rats in Boston will pay strong prevention dividends to BRAP.

Newmarket Square

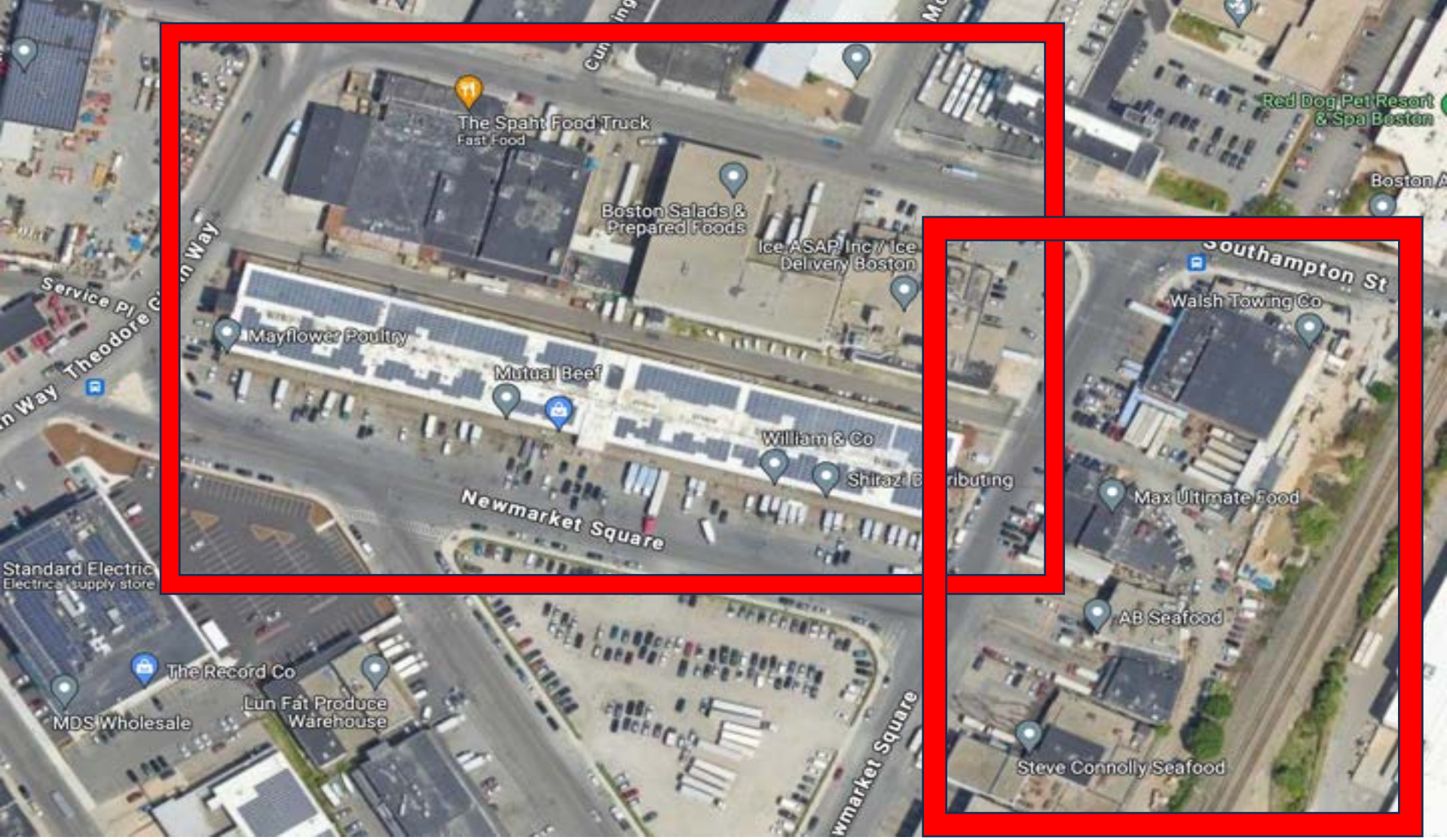


Figure 38. **The Newmarket Food Distribution Neighborhood of Boston.** Even though a large quantity of food is "handled" out of this area, it is not highly conducive to harboring large numbers of rat reservoirs primarily because (aside from possibly old sewers) these *highly industrialized zones* do not provide enough suitable types of rat harborages. Property–level rat infestations can develop at any of the food handling operations in which the rats might exist within the property's walls, basements, ceilings or "yard" if the refuse handling of that site is particularly bad causing the rats to remain true to the site.

Section 2
Neighborhood Rats

2c. City-Managed Properties/Components

(1) Boston Housing Authority
(2) Schools and Playgrounds
(3) Parks
(4) Sewers
(5) Pedestrian Litter Baskets.

Section 2c.

(1) Boston Housing Authority

a) Charlestown
b) Cathedral
c) Mary Ellen

Figures 39-50. In general, the frontal areas of the campuses of the BHA were found to be orderly and clean. Like the pedestrians of any part of the city, or of one SFR on an entire clean block of orderly homes, there will always occur the discourteous pedestrian, homeowner, or tenant that can create conditions for rats for the entire complex.
Nevertheless, the BRAP team witnessed ***that each of the BHA property exterior rat infestations*** were linked directly to each development's refuse staging areas as is seen in the following figures.

Figure 40/40a. Rats are very unforgiving of human mistakes. It only requires one property on a block or one tenant in an entire apartment building to create the conditions for rats to begin burrowing along an apartment building's foundation walls (houses or apartments). Only one.

Figure 40a. Any junk piles or lumber clutter left on earthen ground is highly attractive to the burrowing Norway rat as shown here with their burrows below the boards.

Figure 41-45. A refuse alcove at one of the assessed BPH properties. Every BPH property must maintain their refuse alcoves. This is essential because with city multi- family apartment complexes, these refuse zones become serious rat magnets and property infestations when neglected (Figures 41-45). Rats then spread ***quickly*** to the nearby foundations where they then burrow below the exterior foundation walls (Figure 82), or squeeze through side-gaps in basement assess panels (red arrows) and enter the interior basement below the 1st floor.). From there, rats are adept at following the plumbing tree pipes, or cable bundles into the wall voids of the buildings and find their way into apartments on any floor.

Figure 42. A highly rat-infested refuse alcove at a BHA complex. All refuse alcoves must be attended to daily (at end of day, before the nighttime when rats are most active. Once the refuse accumulates for several days or longer, the job becomes a much bigger lift and the chances of “letting it go ” becomes greater.

Figure 43. The other side of the alcove fence from previous Figure 42. This entire area was riddled with rat burrows and caved in when we walked on top of the soil. All this soil accumulated as rat kick out from the rats digging their burrows below the refuse alcove. These rats have been here easily for months.

Figure 44. The BRAP team assessing another dumpster alcove for its role in attracting rats to the specific BHA property.

Figure 45. Part of the extreme challenge of controlling rats in cities, is it only takes one inconsiderate neighbor to cause a rat-free zone to quickly become a rat-occupied zone. Very difficult to get 100% people on board with tidiness no matter where the homes are located among all the various socio-economic strata.

Figure 46. It is important for all apartment complexes regardless of public or private status to ensure outdoor cooking appliances have been 100% cleaned before the off season, and ideally following each use during during the warmer months. Nothing brings in rats faster than bar-b-que odors (short of chicken coops). Such rats can then invade the nearest dwelling via foundation gaps, utility interstitials, walls and basements. Each year, Boston ISD and BHA should issue public service announcements/ pamphlets, fact sheets, door hangers, etc. prior to the off and on seasons with this message. (Refer to written report).

Figures 47/48. Rats easily access the food trash here by climbing up and down the gate rods. Once they discover this is the path to fresh food, they will have no interest whatsoever in the rat poison box on the ground.

Figure 48. This BHA property's rats had no difficulty in climbing the gate rods and gaining access to the plastic garbage cans for food as seen by the evidence of the rats perching on top of the cans and gnawing apart the lid tabs. The gate and the cans themselves are covered in rat urine and rat body grease (called rub marks). Such is a concern from a public health perspective since human hands will surely have occasional contact with these same surfaces.

Figure 49. The question was raised as to whether these composting crates were causing/attracting more rats to the site. They are not. Abandoned garbage bags, unattended dumpster alcoves and airmailing trash out windows are the typical reasons for rats getting rewarded at apartment house campuses. Once they are rewarded for several times, they know to establish *their own* apartments which occur as multiple earthen burrows as seen throughout this photo report.

Section 2c. City Managed Properties

(2) Schools and Playgrounds

Figure 50-51. As per the discussion, it was not uncommon to encounter areas nearby schools with rat activity. It is recommended a list of all school properties and their proximities/ playgrounds in the city be made and then scheduled as a priority for pro-active (or reactive) rat inspections to ensure they do not (or are not) developing any rat infestations Refer to recommendations within written report.

Figure 51. A recent ***severe*** (but corrected) rat infestation, (red arrow); a school's previous unkempt dumpster area (blue) that grew the rat infestation and the school (yellow) (i.e., children) with its close proximity to the rats

Section 2c. City Managed Properties
(3) City Parks

In virtually all rat-afflicted cities of the world, parks are among the Norway rat's most favorite habitat because they offer rats their natural burrowing element as well as providing them with their natural foods (worms and grubs in the soil, birds and bird eggs above). But human food drops and litter baskets make life even easier for them to get their daily nutrition.

Unfortunately for the city's citizens, the presence of rats in a park often spoils the park's benefits to citizens because many have a fear and/or disgust of rats and/or worry of rats attacking them or causing them or their pets some disease.

Figures 52-63. The parks of Boston, such as the Public Garden, are a beautifully critical infrastructure allowing for work respites, joy, relaxation and recreation to Bostonians all year long. But they are also favorite invasion sites for the Norway rat and thus, they must be monitored at least on bi-weekly basis for new invasions that occur from local sewers or nearby private property yards that contain rats.

Figure 53. Approximately eight burrows exist in this one slope of the Public Garden (four exist on the lower side of the slope). These burrows (photographed in March 2024) are large in diameter—indicating the spring breeding cycle.

Figure 54. Inside parks, rats depend 90% on litter baskets for their food and the remaining 10% from pedestrian litter drop (below benches and the like) and predation of songbirds and other types of natural foods such as acorns, soil grubs, insects, fishes in ponds, etc.). Most times when rat burrows are spotted in parks, litter baskets within a 100 ft. radius of the burrows are usually the primary source of the rat colony's food. Litter baskets in city parks must never contain food trash overnight.

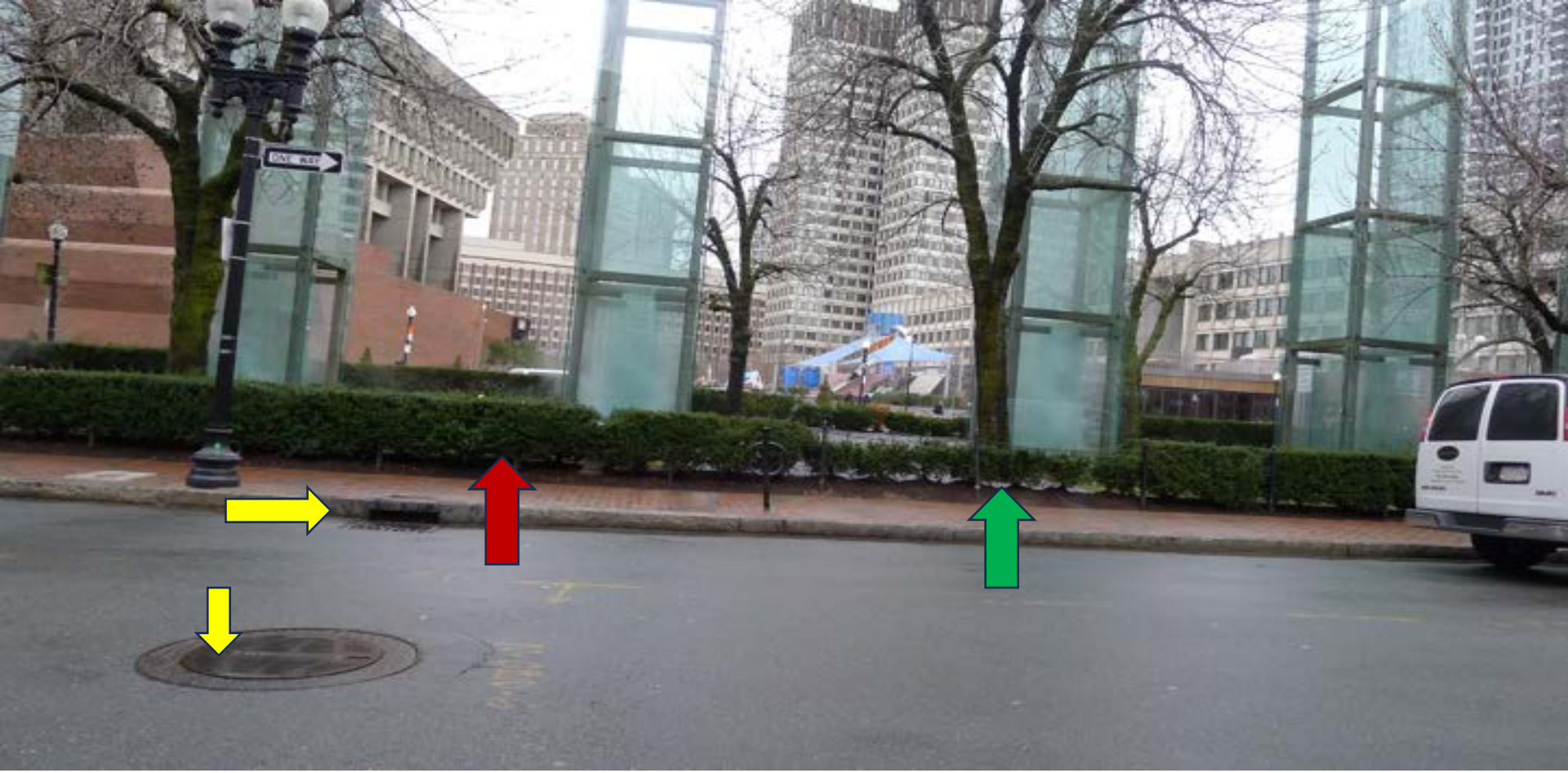


Figure 55. James Michael Curley Park downtown. See also Figures 56-57. The red arrow shows potential rat landscaping harborage very common to parks because the border yew bushes form caves that grow down to the ground. The green arrow shows a pruning style that although is less of a visual border, is much less of an attraction to rats. The Yews to the left can be maintained as is, but they will need to be carefully inspected on a bi-weekly basis for rat invasions. The red arrow bushes will also be more difficult for park staff to clean of trapped papers, cups, food wrappers, etc. Note also, the park is located nearby an old downtown sewer system (Yellow arrows). Sub-surface sewers and surface-level parks are a common seasonal vertical migration event of Northeastern US rats; down to the temperate sewers for the winter; upwards to the fresh park soils (and litter baskets) for the warm weather months.

Figure 56. John Ulrich of ISD inspects around the bases of yew bushes. Because city parks are among the rat's most favorite home during the warm weather months, rat surveillance come March warm up is essential to nip any rat migrations from sewers below to the parks above. Rat surveillance boxes and /or remote sensor boxes can be installed into trophy parks to provide early intervention and save on more work and spent monies several weeks /months later.

Figures 57. Ringer Park, Allston. A classic case of neighborhood rats from one property seriously affecting another. The red stars are the general locations of significant infestations of rats benefitting from the trash output of the bordering residential apartment complexes (yellow stars) and various unkempt yards of the single-family houses as seen in the following figures.

Figure 58. At Ringer Park's main entrance and community building area, these active rat burrows are a direct result of a few unmanaged dumpsters only 40 yds. across the front parking lot. (Note: rats love to establish their burrows/nests in grounds and landscapes that are sloping at the high end of the slope (assists in nature's wick-away function of keeping burrowing animals' nests dry).

Figure 59. Ringer Park is a rat-infested park in several areas as per the red stars in Figure 57. It doesn't take long on a casual hike through the woods in areas where trails meeting the fence borders to see all the rat burrows

Figures 60-61. The southern border of Ringer Park was infested with rats all along the wooded area border facing the back of the large multi-family Commonwealth Apartment complex. Note the residential trash dumpsters on the other side of the property line fence. This entire area was riddled with fresh rat burrows from healthy rats eating well every night.

Figure 61. The messy and unkempt Commonwealth Apartment property's dumpster at the opposite end (SW corner) of Ringer park. This dumpster as those shown in previous figure are 100% responsible for heavy rat infestation within the park. A clear example of how one property owner can cause another property to suffer rats (i.e., rats do not respect fences and property lines). Such scenarios are perfect examples because rat control in Boston takes everyone working together.

Section 2c. City Managed Properties
(4) Sewers

Figure 62-68. In the old sections of a city, there are often old (brick lined) sewer lines below the cobblestone streets (unless they have been replaced with monolithic pipes over the years). If such old infrastructure remains (likely upwards to 150 years old), the old pipes and sewer lines are highly vulnerable to century-long rat colonies (especially in areas such as this where food serving establishments are in high density and very popular). Routine camera scoping by Dept of Water and Sewer in collaboration with ISD staff and possible trapping technology are important considerations. (Refer to written report). Research is currently on-going for sewer remote sensor technology for early alerts for sewer rat numbers that become significantly large and thus threatening to the surface zones above.

Figure 63. Although very unpleasant to us, sewers and their associated pipes are perhaps the city rat's most favored habitat the world over. The famous rat scientist Anthony S. Barnett stated in one of his famous books on rats (2001): "If the Norway rat could design an ideal environment for the survival of its entire species, it might well propose a system of city sewers and drains."

Figure 64. Due to the difficult accessibility of sewers, sewer rats are more difficult and costly to reduce in numbers than are surface rat populations. Nevertheless, a sewer rat surveillance and control program must be included in any city's comprehensive rat management plan. Failing this, sewer rats constantly replace surface rats that have been eliminated via extermination campaigns, which results in decades-long programs of "rat harvests" vs. rat eliminations.

Figure 65. The BRAP team accompanied the Boston Water and Sewers group to several areas of Downtown as selected by the rodentologist (only certain sewers are vulnerable to rats). The DWS teams pulled those manholes and inserted special cameras (arrow) down into the sewers for the BRAP team to view sewer structures and observe for the presence or absence of rats in those everyday street sewers.

Figure 66. After pulling the manhole plate and looking down from the street level, rat droppings (within red circles) are easily noted on the sewer's ledges (similar to a stream running along through a woods, land, etc.) This ledge provides city rat managers a spot to install various types of traps and/or bait stations to assist in sewer rat control.

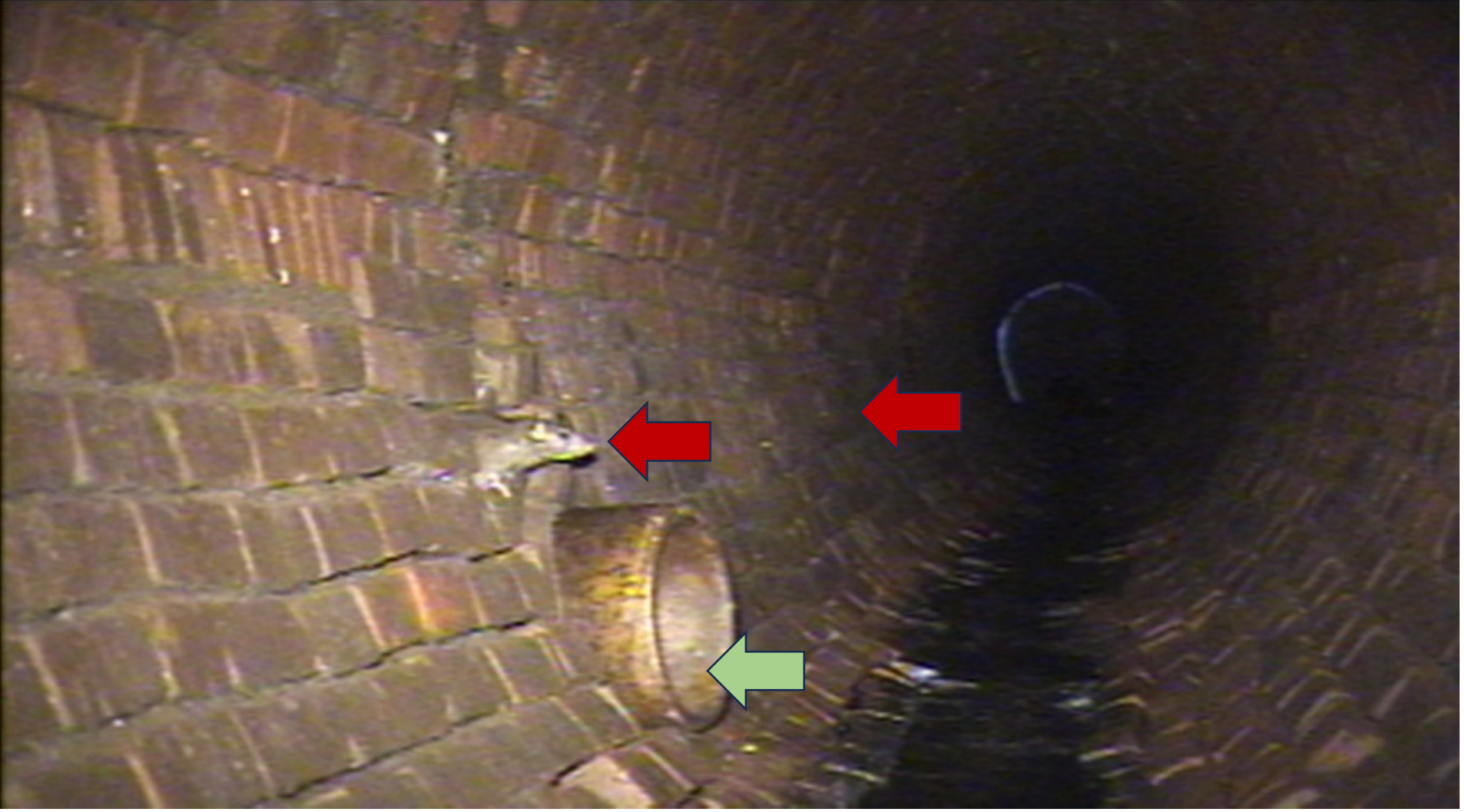


Figure 67. Down below in an older (most vulnerable) city sewer line. Rats (two red arrows) build their nests in the earthen walls behind the brick linings. Brick-lined (old) sewers are the rat's choice for nesting populations because the brick enables them to climb up, down and along easily to adjust to the various levels of rains and floods, etc. The rats access the surface by traveling along the main street surface corner basin line (green arrow). See written report for additional discussion and management recommendations. (Photo NYC sewer).

Figure 68. Rats love establishing burrows and tunnels within urban tree squares. The actual burrow and nest is likely located below the sidewalk and not in the soil of the tree square. Too, often tree roots may penetrate a nearby building's wastewater lateral that it passing below the sidewalk these tree squares and the street prior to emptying into the sewer in the middle of the street. In such cases, sewer rats may be simply using the tree square as a portal to the surface where they forage for bagged food trash, litter baskets and the like each night before returning to the sewer through the tree square burrow hole. Sometimes, the rats will nest and burrow around the tree root ball gnawing on the roots and killing the tree—very common and may have been the cause of the death this tree. A case-by-case scenario.

Section 2c. City Managed Components

(5) Pedestrian Litter Baskets

Figure 69. Along all busy pedestrian streets of any of the 22 neighborhoods of Boston, litter baskets are an obvious essential city infrastructural component. But often, if litter baskets remain full all night long and are collected in the morning hours, they can be a strong driver of local rat population increases. This is usually overlooked, or woefully underestimated by city sanitation logistics. Basket design, numbers, placement, collection frequency and times, maintenance, etc., are all crucial to reducing the relationship between litter baskets and rats. See written report.

Figure 70. When properly maintained and undamaged by the public, Big Belly™ litter baskets are rat-proofed litter baskets. But maintenance costs play a role as well. In low-abuse areas such as college and office building campuses, with close maintenance attention and cleaning, these litter receptacles have proven very effective in rat prevention.

Figure 71. The textbook frustration of litter baskets, their use and maintenance, and the establishments of rats nearby baskets that aren't maintained. It only takes a few out of many to cause issues unless baskets are very carefully designed and maintained. Easier said than done within the scope of most city operations and budgets.

Figure 72. A new ‘rat-proof’ litter basket is being piloted in Boston. The key to its sustainability will be the hatch door staying in good condition to prevent the can from getting jammed open due to overfilling.

Figure 73. Notice all the food grease stains on the sidewalk square upon which the can sitting…insightful relative to rat activity on a particular block and lot.

Section 3.
Rat Damage to Boston Infrastructures and Properties

Rats are dismantlers of city infrastructure and important structural components.

Rats are not only public nuisances; they are economically important infrastructural pests. During the BRAP city assessment, it was a startling to observe the scope of rat damage to as wide range of the Boston city considering only a small portion of Boston's 22 neighborhoods were assessed. As a consultant that conducts surveys in multiple cities, the impact of rats in Boston is notable. Part of the goal of the BRAP is to put this damage in check, otherwise future infrastructural repairs to streets, sidewalks, retaining walls, etc. from rats will be very expensive. Early intervention is always the smartest economic investment in city rat IPM programs.

City areas of rat damage (some of which are shown here) include: foundations, sidewalks, tree squares, street drains, sewer lines, park statues, building doors, retaining walls, wires and cables (automobiles, trucks, planes, trains, office building computers/electronics, etc), copper gas line punctures (i.e., fires), refuse cans of residential and commercial facilities of all sorts.

Figures 74-88 Commonly seen rat damage. Cheap, plastic garbage cans (CPGC) are one of the main culprits for feeding rat colonies in residential areas of every city. These rats increase in numbers and spread to other properties, blocks and gradually over time throughout a neighborhood. Rats can gnaw through a brand new CPGCs containing food the very first night the CPGC is installed. **High density** plastic cans with tight fitting lids are available for deterring rats, but of course cost more than the CPGCs. (Notice the rat teeth imprints on the plastic. A quick measurement of 4mm = (rats) (2mm = mice).

Figure 75. Within a Boston alley. A frequently noted scenario in multiple areas of Boston during the two-day field BRAP assessment. Norway rat destruction of sidewalks and building perimeters often results in serious damage to the foundations, cracking of sidewalks, basement flooding, etc., because such rat holes and cracks leads to water seepage into these areas; and during the winter the freezing channels expand blowing out walls, and other structural elements.

Figure 76. Very expensive sub-surface damage to the roadway, the sidewalk, the curb, and the associated drain basin which has been repeatedly repaired due to rat tunnels year after year. Notice the rat waiting to scurry to the food trash bags. This rat is the tip of the rat-berg below. (Corrigan, 2021, NYC).

Figure 77. Notice the obvious rat tunnel/runway running below the brick sidewalk (red line). Brick walls and sidewalk embankments are among the rat's most favorite environments in which to construct sub-surface tunnels. They also burrow below asphalts of driveways and those surrounding/supporting street drains (See Figures 78-79).

Figure78. Roxbury had severe rat infestations in nearly all areas visited. Note this yard and the sidewalk (and multiple bait stations trying to fight off the rats). The rats have burrows already constructed beneath the new asphalt (red arrow). How much of this entire new asphalt sidewalk is due to previous rat burrowing/destruction?

Figure 79. The BRAP team members discussing the heavy rat activity in Roxbury. Many of the sidewalks and front building foundation areas contained damaging rat tunnels and burrows.

Figures 80-81. A closer viewpoint of the dumpsters with spilled and overflowing food trash. This retaining walls is being completely dismantled by the rats burrows (Red box). All the soil (green arrows) is a result of rats excavating the support fill out of the wall. Eventually, this wall will collapse should a car “nudge it” while backing into one of the allocated parking spots on the other side.

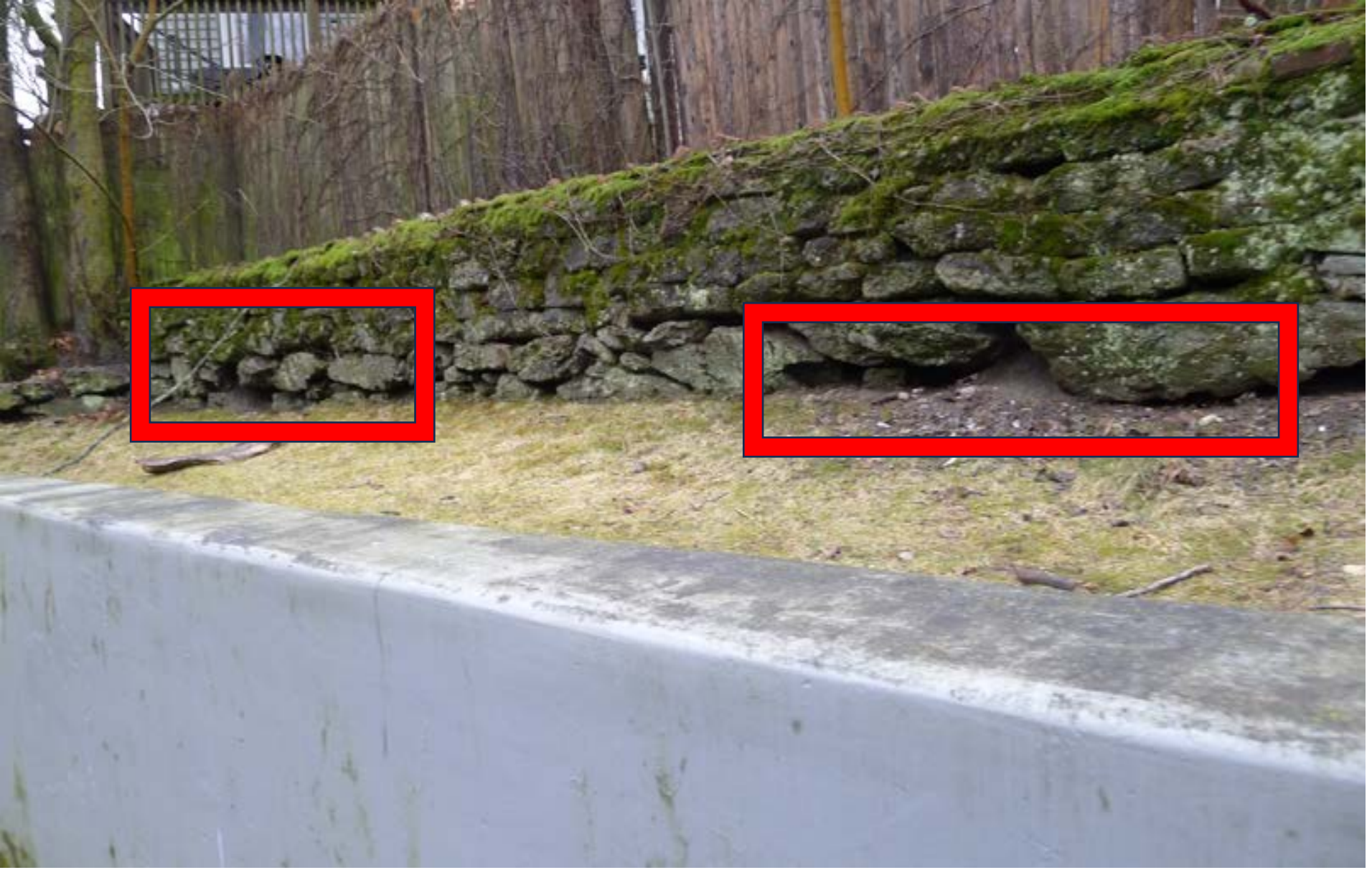


Figure 81. Rats burrowing and quickly disassembling a stone wall in a small park space in Roxbury. Once the stone wall collapses, then what?

Figure 82. Large space of foundational support soil/fill removed by Norway rats and filled in with gravel by staff at a BHA building. The very industrious rat will often simply begin again at the margins of the fill (red arrow) continuing the frustration. The key is to intercept this at the very first hole when it would require a mere cave in of the one hole. Once it progresses as seen here, it becomes a laborious $$ project.

Figures 83-84. Norway rats prefer to locate their burrows and nests below heavy objects for the protection such provides (cement slabs of all types, roads, sidewalks, boulders, etc.). Rat burrows remove the support fill and soil for the infrastructure resulting in stress cracks and/or eventually the collapse of the infrastructure. If left unaddressed, these park benches will be significantly compromised and will require expensive repairs and/or replacements. (A recent NYC park bench).

Figure 84. Sidewalk and retaining wall dismantling by one block's Norway rat colony. Each of the 10 red arrows points to an entire sidewalk panel undermined by rat tunnels running below. If rat burrows are not intercepted quickly, their tunneling destruction proceeds over months, not years. Note the all-too-common asphalt patch repairs (blue box) which never last for very long and are aesthetically unpleasing as well as presenting a tripping hazard to pedestrians. Damage costs for city Departments can run into the millions. (Photo: Corrigan, 2023) New York City.

Section 4.

The *Potential* for Rat Dispersals Associated with Demolitions and Major Construction Programs.

Figure 85. It is a half truth that construction projects will suddenly cause rats to invade neighborhoods. If rats are not already present in the sub surface zones scheduled to be “dug up”, there obviously will be no rats. But in old parts of cities that have had rat populations for decades, rats unseen and unbeknownst to us at the surface dimension of the city, do in fact commonly exist or use those sub-surface active and old infrastructures and the myriad of interstitial spaces associated with those zones. If rats are present existing in sub-surface old sewer laterals, or abandoned infrastructure pipes, or in existing sewer lines of that specific area, then of course such rats may be dispersed upon the massive disturbance to their sub-surface harborages. But if such rats ARE present, then what are their food sources at the surface level? Rats cannot survive mysteriously below ground without fresh food on a regular basis unless garbage sink disposal units are being used.

Figure 86. Right below our feet in the highly commercialized area of cities everywhere, there is a **world** of century -old abandoned pipes and thousands of interstitial spaces surrounding those pipes in just one neighborhood. As long as there are food sources on the streets directly above those spaces (litter baskets, garbage cans, dumpsters from eateries, etc., rats will exist in those worlds. However, if food is scarce above and/or too difficult to access each night due to a city's tight sanitation culture and/or enforcement codes, a few rats may exist, but there will not be large colonies waiting to "explode" to the surface with the onset of the jackhammers (contrary to the pervasive urban myth). Nevertheless, rodent control surveillance and control programs must be in place months before large scale construction begins including an enhanced sanitation drive. Placing rodenticide bait boxes all over will not stem off any disturbed populations

Figure 87. Pre-demolition and/or earth moving construction sites should *always* be surveyed for established rat *presence prior to the* demo-construction event. The blind practice of placing out bait boxes at a construction site rat-sighting unseen just as tangible practice would not control any rats should they in fact be present. (A very worn city rat myth). The one bait box installed along this fence might give the impression "something" is being done to control any "disturbed rats", but a Best Practices Protocol for Construction Site Rodent IPM needs to be included to provide true protection to the community against disturbance of any existing rats as determined via a BRAP-assessment and survey. (Roxbury MA).

Figure 88. The interstitial spaces that occur on all sides of these pipes between the earth and common building utility laterals are among the most common areas of rat/mouse harborages (and with sewer laterals –entry) in urban areas and building perimeters—especially if there are penetration points at the foundation that are not sealed correctly with the right materials, or they break down over time. Moments before taking this photo, a rat was seen carrying a big piece of food and disappearing into some mystery cavity where the pipe connects to the building (next photo).

Figure 89. A moment before I took this photo, a large, old rat, in broad daylight, carrying a large piece of food disappeared into the dark hole of the interstitial spaces associated with this emergency water line. The takeaway is that construction may expose rats that were there unbeknownst to the locals all along, but construction does not "cause rats" to suddenly develop in a neighborhood that was previously free of rats. *Enhanced sanitation alerts and efforts to citizens a month or two prior to any construction in any Boston neighborhood that has filed 311 complaints will have a 100X greater impact on reducing how many rats or mice are seen once construction begins. (See written report).*

Section 5.

Enhancing Boston's Rat Integrated Pest Management Approach via the Boston Rat Action Plan.

5a. Early detection and intervention of rat colonies and populations via the use of remote rodent sensor technology.

5b. The Environmental Threats of Anticoagulant Rodenticides In Boston.

5c. Preparing for the EPA's 2024 Rodenticide Restrictions: A Suggested IPM Tool Kit for BRAP Moving Forward.

5a. Early detection and intervention of rat colonies and populations via remote rodent sensor technology.

Figure 90. These small, powerful rodent sensors, can be placed inside exterior bait stations (toxic or non-toxic), or can be installed w/o bait box to monitor for the 24/7/365 presence or absence of rats (or mice inside) around or inside a property. Alerts of each rodent at each minute of a day/night and their precise location are sent to a phone, tablet or desk computer. Data dashboard software provide up–to-date alerts and status, and progress of rat control on blocks, alleys, parks, building perimeters, refuse staging corrals, campuses, and many other applications. *Essential technology* large-scale Rat IPM programs as well as for municipality program cost efficiency. (EverSmart® Rodent Sensors (Microshare.io) shown here, but no endorsement implied over any other rodent remote sensor technology).

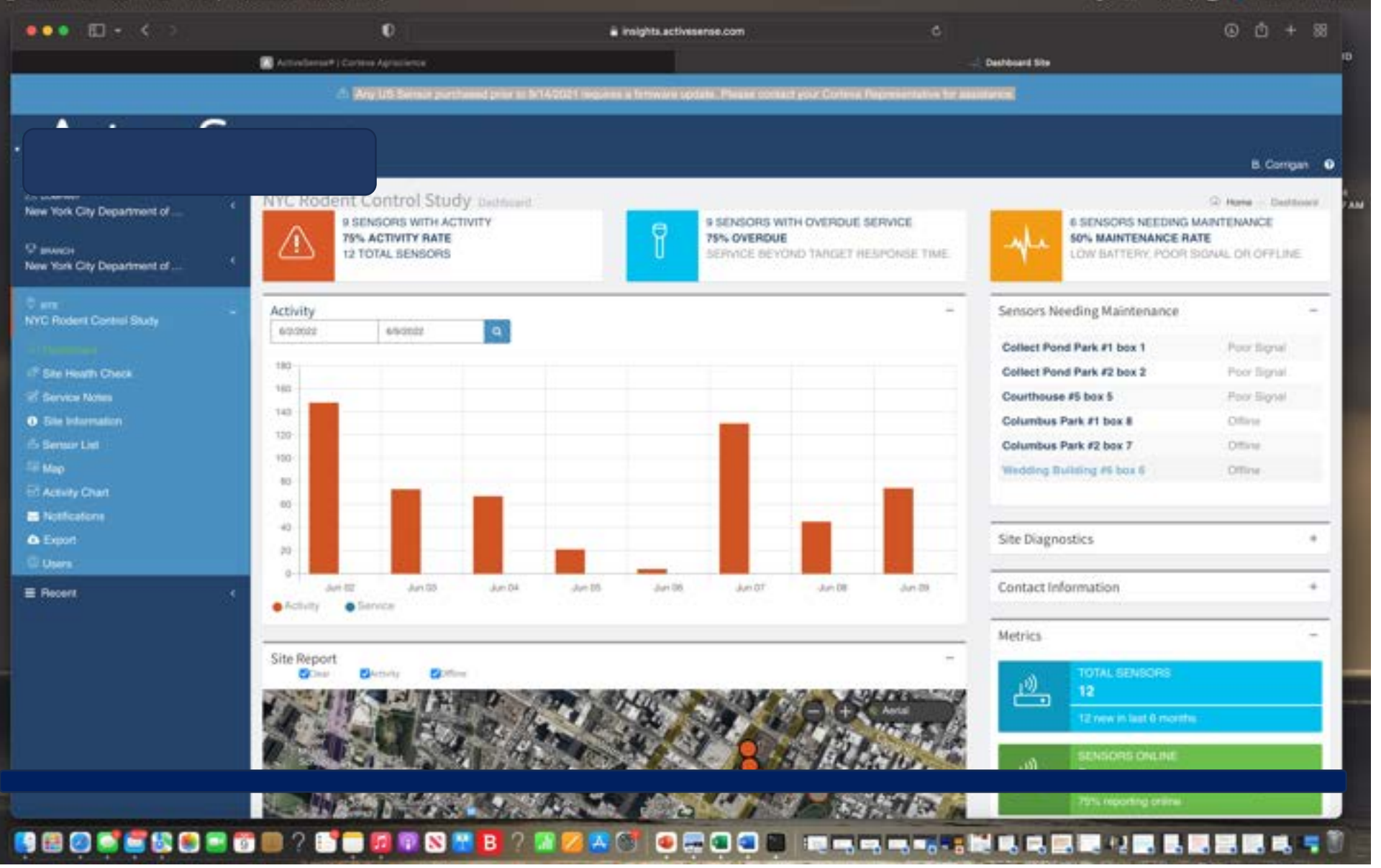


Figure 91. A remote sensor dashboard used in city-level (NYC) rat control research (for 3 years) by RM Corrigan. The insight into rat populations and distributions allows for targeted remediation. For municipal rat management programs such preciseness is invaluable. (Scientific publications pending).

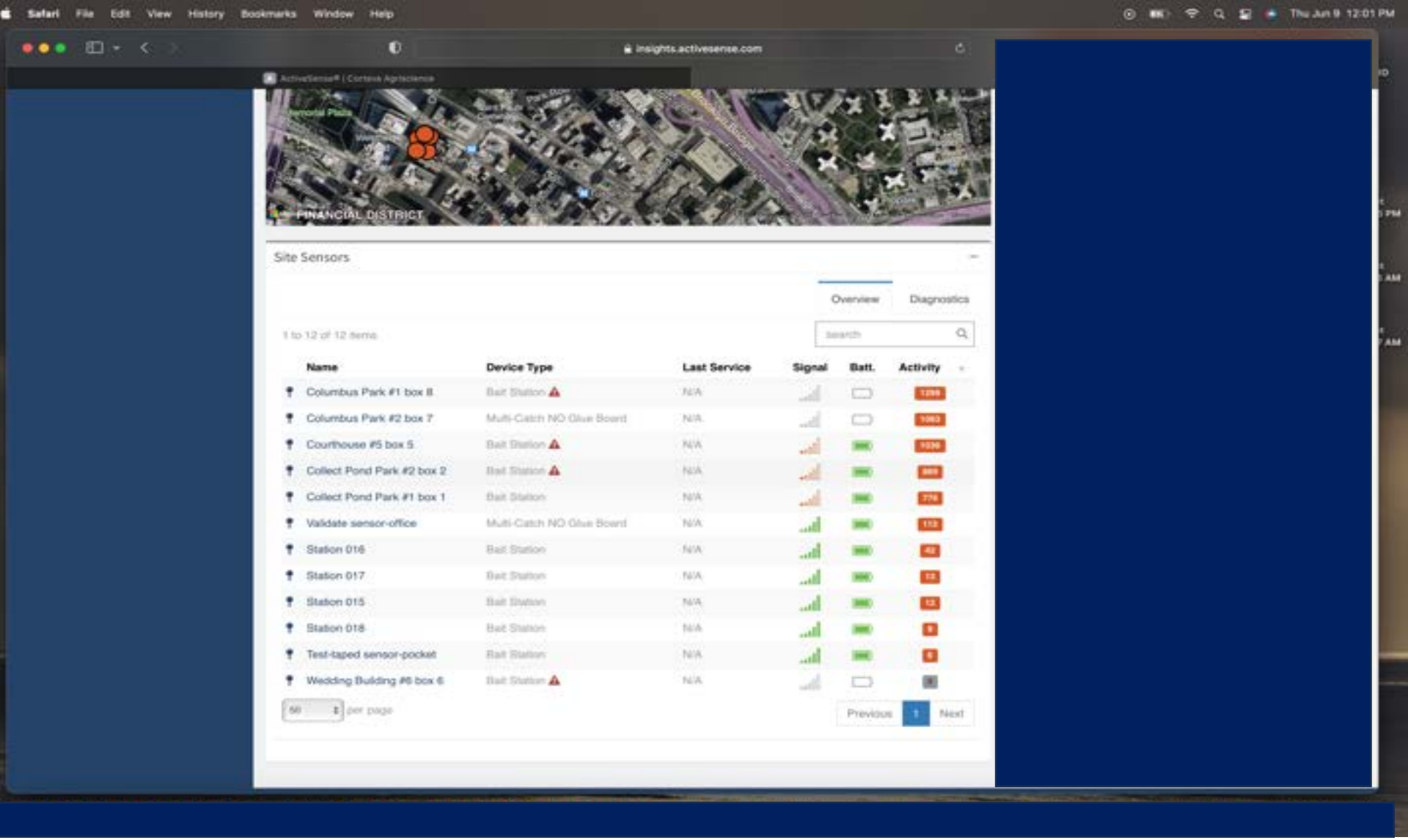


Figure 92. Remote Sensor Technology Software provides incredible data for each sensor in each box. And data can be presented in multiples of perspectives depending on the interest (location, building side, park quadrant, etc.). In this case, I filtered the dashboard to organize the rat visits per station within a community park by most to least. This instructs a city as to where to best spend their labor resources and materials most economically. Over the long run, large sums to a program's city budget line can be saved.

5b.
The Environmental Threats of Anticoagulant Rodenticides in Boston

Over the past decade rodenticides (i.e., pesticides for rats) have proven to be highly toxic pesticides within city environments the world over due to secondary toxic drifting. Although the goal of BRAP is to achieve a sustainable reduction in Boston's current burgeoning rat population, we must at the same time be highly mindful of Boston's residents, companion animals, urban wildlife, gardens, landscapes, and surrounding waters when these chemical tools are employed.

Within a true urban rodent IPM program (i.e., integrated approaches), rodenticides by formal scientific definition are to be used ***only after all the other steps of an integrated program (sanitation, rodent exclusion, etc.), have been exhausted.***

Based upon the results of the BRAP field assessments into different neighborhoods and infrastructures of Boston City, there is room for enhancements in Boston's IPM program in this regard.

Figure 93. Conventional Rodenticides (mostly anticoagulants) of multiple brands have come under critical environmental scrutiny by biologists the world over and encompassing a wide swath of mammals, birds, fishes and reptiles that also occupy the urban spaces. Wildlife have been secondarily poisoned when rodents are consumed by animals within these groups (e.g., hawks, eagles, owls, fox, snakes, songbirds and others). The US EPA will make an important decision to the availability (or not) of rodenticides for rodent control in November of 2024. Multiple state legislations however, regardless of the pending EPA November decision, are currently considering heavy restrictions or bans on rat poisons before then. See Figure 96 below and consult the Web for the scope of this issue.

Figure 94. The ingredients in this bait boxes within a residential alley of Boston is an important notation as some brands of baits are more toxic to non target animals (including dogs) than others. This specific rat poison box contains the active ingredient: ***Brodifacoum*** which is the most toxic anticoagulant baits and has been repeatedly responsible for the death of hawks, owls, dogs, and other non target animals all over the world. In BC Canada, all of the Europe Union, California and other areas, this bait and its anticoagulant cousins have been banned from use because of their serious threats to wildlife. This is the justification for the Harvard Law School's recent 58-page petition calling for a suspension of these baits in the state of Massachusetts.

Figure 95. When predators feed on city rats and mice, they succumb secondarily to the poisons the rodents consumed within the bait stations around buildings because it may take upwards a week or more before the poisoned rat or mouse dies. During that time, they remain active, but become slower moving each day and move slower enabling their enemies to easily capture them. Refer to Figure 96 for discussion and/or Google *Rodenticides and Wildlife* to learn of the serious environmental issue with these products. Many scientists report rodenticides cause worse environmental damage than DDT did back in the 1970's with their terrible impact on eagles and other raptors everywhere.

HARVARD LAW SCHOOL
ANIMAL LAW & POLICY CLINIC

May 13, 2024

Michael Moore, Director, Bureau of Climate and Environmental Health Food Protection Program
Ashley E. Randle, Commissioner, Department of Agricultural Resources
Brian Arrigo, Commissioner, Department of Conservation and Recreation
Dr. Robert Goldstein, Commissioner, Department of Public Health
Richard Berman, Public Member
c/o Hotze Wijnja, Environmental Chemist
Pesticide Board Subcommittee
Massachusetts Department of Agricultural Resources

Via email: Hotze.Wijnja@mass.gov

Re: PETITION TO SUSPEND THE REGISTRATIONS OF ANTICOAGULANT RODENTICIDE PRODUCTS IN MASSACHUSETTS

Dear Members of the Pesticide Board Subcommittee:

Figure 96. It is important for the BRAP to note the highly significant negative ecological impact of the current rat poisons (i.e., within most of the black boxes seen all over Boston). All cities (especially within Massachusetts as per the very recent petition above) will need to prepare for a new paradigm in urban rat management without the current use of the anticoagulant rodent baits. Without these poisons around buildings everywhere in Boston, the city would reflect a much healthier urban ecosystem. This is environmentally smart because most Boston rat control is, according to sound science achieved via refuse management, not via a pesticidal band aid in lieu of addressing the No. 1 reason for the rats.

Figures 97-98. Multiple photos could be presented here as to dangerous misapplications of the current rodent poisons of toxic concern. Such applications are often done by homeowners/building supers, etc. buying off the internet and do-it-yourself sites. Dogs, cats, children, and wildlife are all at risk with these types of DIY applications in back yards, alleys, etc.

Figure 98. Here also are misapplications of professional-strength rodent poisons stuffed down rat burrows at an apartment complex in NYC (the rats always kick these back out on top of ground as is seen here). To children, these can appear like dropped packets of candies. Dogs will eagerly consume them. Such dangerous applications are made by lay homeowners in every city. The property person is better directed by asking themselves “where is the food source feeing these rats and eliminating that portion of the problem.

Figures 98-99. A testimony as to how this and other property owners associated with Boston alleys (and many other areas of Boston) “fight” against their rats and desperately want “something” done. This is a highly unprofessional/opportunistic installment of 12-13 poison baits into a residential area. If there is a severe infestation of rats in this alley (as the poison baits seem to indicate), the solution is to ask: “Where is the rat’s dependable *nightly* food source that are supporting so many rats ?”. Once the food is corrected, only 2-3 boxes positioned in the precise rat-behavioral spots of this alley would be required.

Figure 100. Similar to the issue in the previous figure, Boston ISD is seen here assessing the situation of a long row of rodenticide bait boxes along this fence border. The boxes have been installed by a pest company in response to a severe infestation of rats caused by excessive garbage on the other side of the fence. No matter how many bait boxes are installed here or anywhere, until the garbage is removed and/or made 100% unavailable to the rats, the bait boxes offer *very little value.* Unfortunately, some property owner not aware of this fact is paying for that 'very little value' with each box installed.

5c. Preparing for the EPA's 2024 Rodenticide Restrictions: A Suggested IPM Toolbox for BRAP Moving Forward.

The Boston Rodent Action Plan (BRAP) Non-Anticoagulant Bait* IPM Toolbox (2024-2026)

1. Non anticoagulant baits
    a. Bromethalin (e.g., TakeDown II ™) **
    b. Cholecalciferol (Selontra ™, Cadet ™)

2. *First Gen Anticoagulants (e.g., Flatline ™) (low wildlife toxicity).

3. Carbon dioxide and carbon monoxide burrow treatments.

4. Advances in Trap Technology (Parks, Sewers).

The Boston Rodent Action Plan (BRAP) Non-Anticoagulant Bait* IPM Toolbox (2024-2026)

5. Pest Proofing Technology Doors (e.g., Haymarket doors, turf and landscaping park applications).

6. Rodent Proof litter baskets.

7. Remote Rodent Sensor Technology for Strategic Strike interventions of neighborhood rodent infestations and their causative conditions.

8. Wildlife-friendly rodent-toxic baits in development.

** No endorsement of any product is intended by mentioning the common rodenticide products on the marketplace.

End.

Robert M Corrigan, Ph.D. Urban Rodentologist Consulting, Chappaqua, NY.