A Plan for

Renewable Rikers

Rikers Island Aerial View, October 9, 1940. Image from NYC Parks Dept Photo Archive, used with permission.

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Rikers Island Jail Complex, March 2013. Image by Formulanone via Wikimedia Commons (Creative Commons Attribution 2.0).

Introduction

The bare minimum to start addressing Rikers Island's horrific legacy is to ensure, as the jails there are closed, that the island's future uses benefit and respond to the wishes of the people and communities that have been harmed through its long, painful history. After hundreds of conversations with people who have been incarcerated on Rikers and had loved ones there, a consensus emerged: use the island for green infrastructure through the Renewable Rikers plan. By transferring the island from the control of the Department of Correction to other agencies for green infrastructure uses as outlined in the three laws passed by the City Council in 2021, New York City can further solidify the end of the Rikers Island jail complex.

As the map on the following page illustrates, Rikers Island sits at the confluence of noxious peaker power and aging wastewater treatment plants that disproportionately burden the nearby neighborhoods of color. Retiring and replacing these facilities with solar energy, battery storage, and a consolidated wastewater treatment plant on Rikers would liberate large swathes of waterfront property for communities to redevelop according to their own needs and priorities—and eliminate severe health risks. A third use proposed in the Renewable Rikers plan is food scrap and yard waste recycling. The proximity of three marine waste transfer stations make Rikers Island ideally situated to become a hub for organics processing, relieving nearby communities from burdensome truck traffic and reducing the volume of waste sent to distant municipalities.

The Renewable Rikers plan is an important investment for the City as a whole to meet its ambitious decarbonization goals, while serving as a model for a climate transition rooted in redistributive justice and shared community leadership. Beyond phasing out nearby polluting infrastructure, a research and training institute will enable front-line communities to gain education and skills in green occupations using the island as a testing ground for innovative technological and pedagogical approaches.

Few things could mark the end of the Rikers Island penal colony more definitively than transferring the land for positive use. The plan presented here is admittedly a long-term vision that will require continuous input from communities most impacted by Rikers and sustained activism from a broad coalition of New Yorkers. It will likely take generations to repair the harm Rikers has done to Black, Brown, and poor New Yorkers, but we need to start somewhere. The opportunity to use over 400 acres for the benefit of communities that have borne the brunt of mass criminalization, environmental burdens, and disinvestment is both rare and extraordinary.

Rikers as Infrastructural Nexus

- Wastewater Resource Recovery Facility
- Peaker Power Plant
- Marine Transfer Station
- Waste Transfer Stations (private and municipal)

Floodplains

- 2020 100-year floodplain
- 2100 100-year floodplain

2-Miles

1-Mile

BRONX

Harlem River

Harlem River Yard

Hellgate

HUNTS POINT FOOD DISTRIBUTION CENTER

Hunts Point

Tallman Island

EAST RIVER

Wards Island

Astoria GT

Astoria ST

Astoria Energy

CON-EDISON

RIKERS ISLAND

91st Street

Bowery Bay

BOWERY BAY

LAGUARDIA AIRPORT

FLUSHING BAY

North Shore

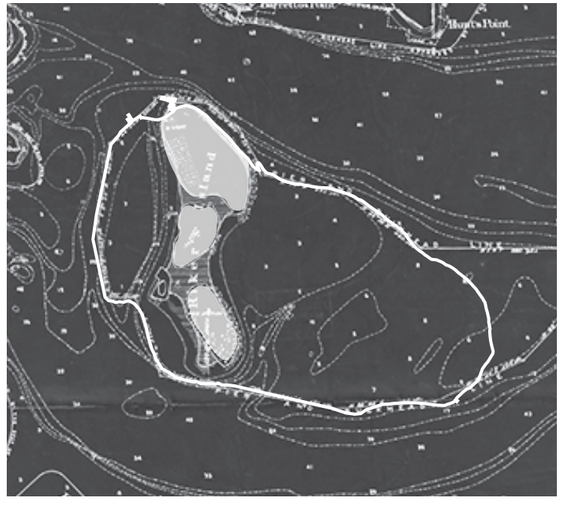
QUEENS

0 .5 MILE

Floodplain: FEMA based on the NY Panel on Climate Change's 90th Percentile Projects for Sea-Level Rise (11 inches for 2020 and 75 inches for 2100)

Landfill Expansion over Time

1893
68 acres



1924
262 acres

1969*
413 acres

2021
413 acres

[Right]
Aerial view of the first jails constructed on Rikers with landfill mounds in the background, ca. 1936.
Image from New York World's Fair 1939 and 1940 Incorporated records, New York Public Library.

[Left]
* Rikers Island had expanded to its current footprint by 1943, 26-years before this aerial image was taken.

1893
"Modification in the pierhead and bulkhead line around Riker's Island, East River, New York, as recommended by the New York Harbor Line Board" Norris Peters Co. New York Public Library.

1924
New York City Aerial Set 1924, Fairchild Aerial Camera Corporation, New York Public Library.

1969
"Hounts Point, Longwood, Riker's Island" New York City Planning Commission, New York Public Library.

2021
Google Earth

Starting in the late 19th century, Rikers Island was expanded via landfill by six times its original size to over 400 acres. The practice of filling in tidal wetlands with trash to create more usable land was a common practice throughout New York City—it is estimated that 20% of the city's landmass was created from solid waste and excavated fill.[1] Rikers Island is unique, nonetheless, in that it served as one of the city's main municipal landfills up until the mid 1930s when at its zenith a dozen mounds of about four thousand feet apiece dotted the island. Reports characterize the city's discards from this time as a majority coal ash with a mixture of food scraps, woods, and other organic materials.[2]

Almost a century has passed since the last refuse barge was emptied on Rikers, but the island's status as a landfill repeatedly reemerges in the documentation of gas leakages, sewage back-ups and instability beneath building foundations.[3] Although no official investigation has been conducted into the current soil conditions on the island, numerous complaints point towards the likelihood of methane emissions, a result of organic waste degradation, and the presence of carcinogenic polycyclic aromatic hydrocarbons (PAHs), which are associated with coal ash discards.[4]

This complicated environmental history undoubtedly limits options for redevelopment and further justifies the island's conversion to green infrastructure. Any future excavation or construction on the island will require a thorough environmental assessment and special protections to prevent potential exposure to contaminants. Compared to residential or more public facing functions, however, industrial reuse will significantly minimize the level and cost of remediation and curtail potential adverse health impacts.

1. Daniel C. Walsh and Robert G. LaFleur, "Landfills in New York City: 1844-1994," Ground Water, vol. 33, no. 4, July-Aug. 1995.

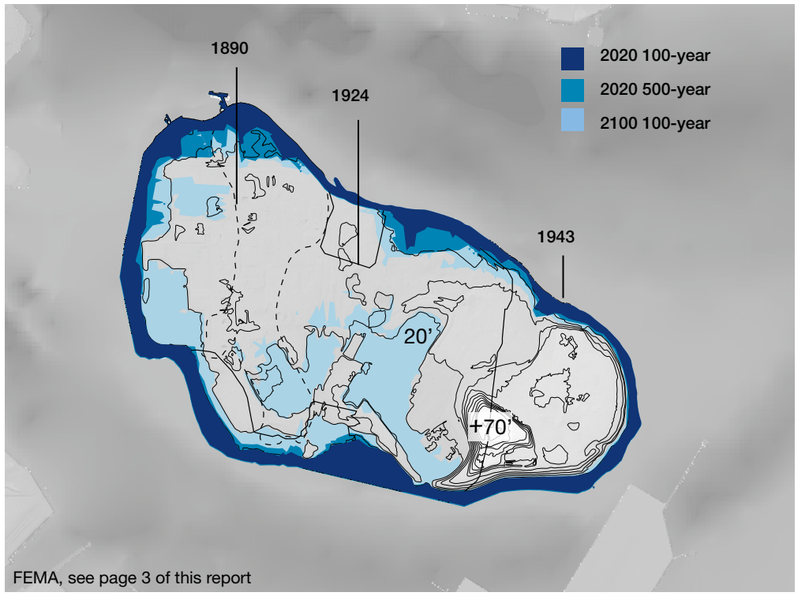
2. Martin V. Melosi, Fresh Kills: A History of Consuming and Discarding in New York City, New York Columbia University Press, 2020.

3. Raven Rakia, "A Sinking Jail: The Environmental Disaster That Is Rikers Island," Grist, March 15, 2016 and The New School Urban Matters, "Environmental Hazards and Design Flaws of Rikers Island," Center for New York City Affairs, May 17, 2017.

4. Daniel C. Walsh and Robert G. LaFleur, "Landfills in New York City: 1844-1994," Ground Water, vol. 33, no. 4, July-Aug. 1995.

Challenges and Constraints

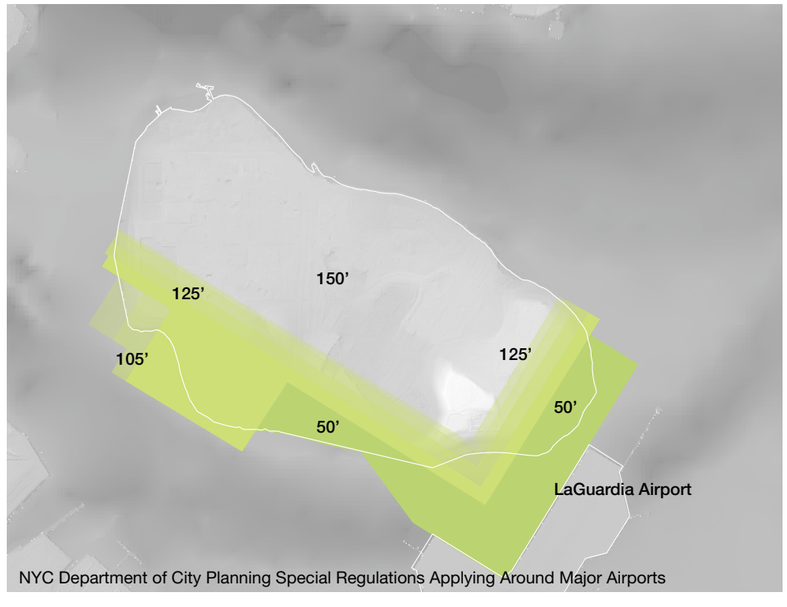
Historic Fill and Floodplain Projections



FEMA, see page 3 of this report

Due to the history of landfilling, Riker’s topography is more elevated than the surrounding low-lying neighborhoods. Although only the perimeter falls within the 2020 100-year floodplain, future development must reflect projected increases in sea level rise and storm surge.

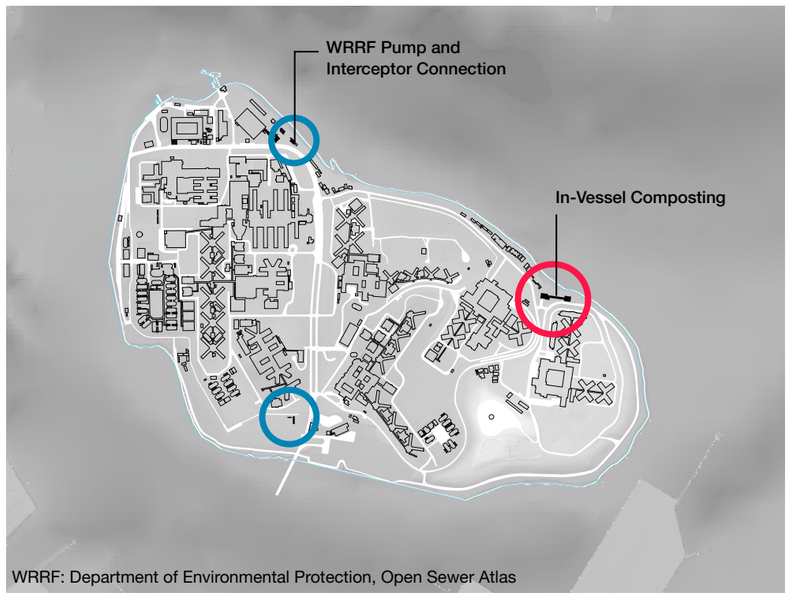
Height Restrictions



NYC Department of City Planning Special Regulations Applying Around Major Airports

Construction is limited on much of the island to 150 feet and further restricted to 50 feet on the island’s south and eastern shores, due to the close proximity of LaGuardia Airport.

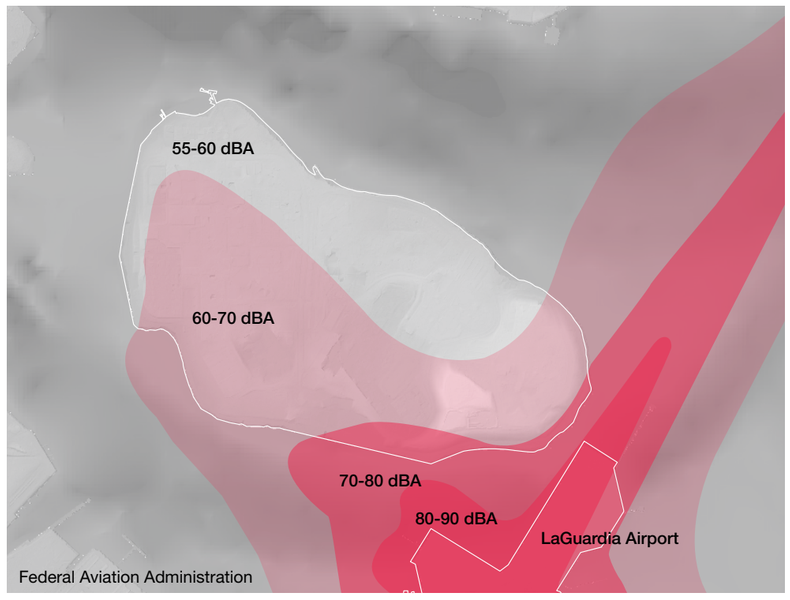
Critical Infrastructure



WRRF: Department of Environmental Protection, Open Sewer Atlas

Two interceptor pipes and pump stations located west of Hazen Street currently convey wastewater to the Hunts Point and Bowery Bay WRRFs. These nodes, as well as the existing in-vessel composting facility, should be preserved and retrofit.

Day-Night Average Sound Level

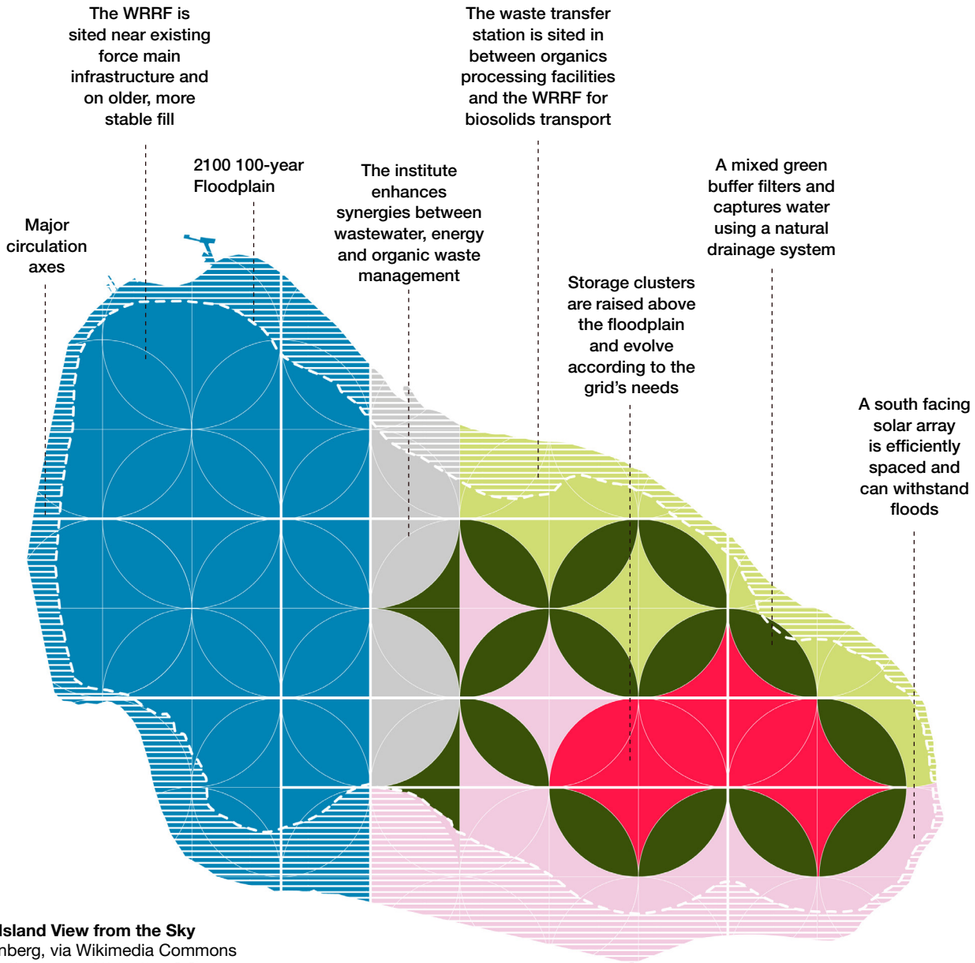


Federal Aviation Administration

Rikers is subject to excessive airplane noise with much of the island within the 60-70 decibel (dBA) range. The Federal Aviation Administration sets 65 decibel (dBA) as the threshold value at which health problems associated with elevated noise levels can emerge.

Renewable Rikers Plan

Renewable Rikers Design Concept



Rikers Island View from the Sky
By Tim Rodenberg, via Wikimedia Commons
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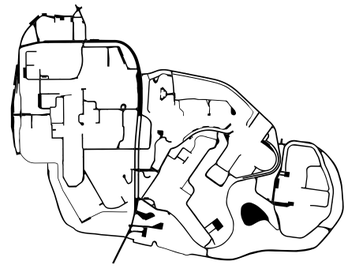
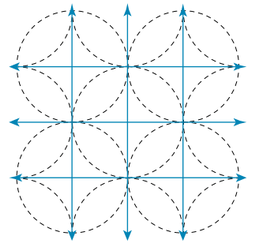
Infrastructural Use

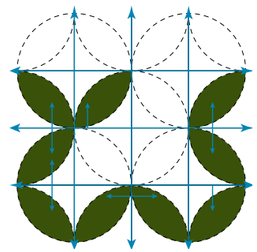
- Wastewater Resource Recovery Facility (WRRF)
- Research and Training Institute
- Waste Transfer and Processing
- Energy Storage
- Energy Production



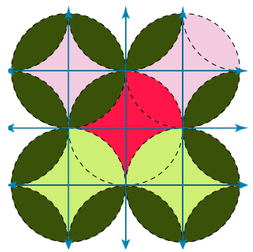
0 Rikers Island's grid developed in an ad hoc fashion through landfill and jail expansion.



1 Extending the orthogonal grid from the west establishes circulation and stormwater conveyance axes.



2 A secondary grid establishes a green buffer and natural drainage system on the eastern side.

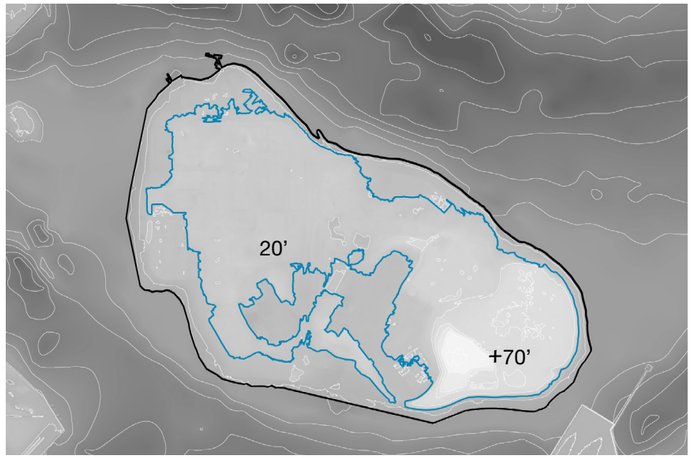


3 Infrastructural clusters can evolve according to future needs and conditions on the island.

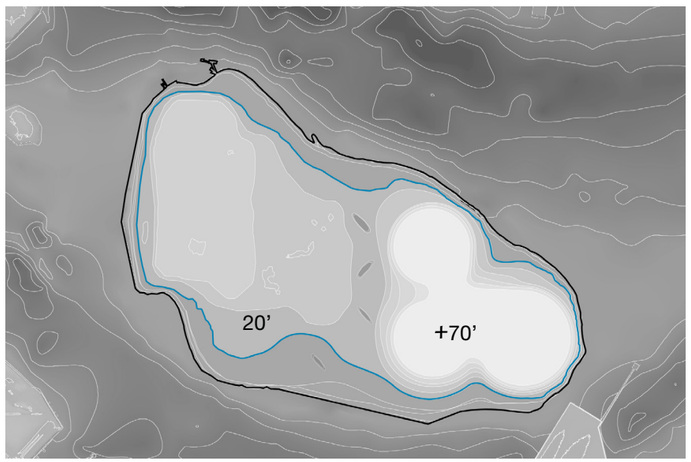
The Renewable Rikers plan utilizes a flexible grid layout for siting and leveraging synergies among wastewater, organic waste, and energy infrastructure. Given the constraints of unstable ground associated with landfilling, projected sea level rise, and airport related noise and height regulations, the more building intensive wastewater management and research and training institute are proposed for the western side of the island. While the construction of the WRRF will take years, solar arrays and composting facilities can be introduced within a much shorter time frame. There, the intersection of the orthogonal and circular grids produce a patchwork of planted zones and retention ponds that promote robust environmental performance, from water filtration to carbon sequestration, and ameloriates impacts from more intensive industrial uses. In the east, the grid offers more flexibility for the evolving, and distributed needs of energy and organics processing technologies. As is the case today, the majority of New Yorkers will only experience Rikers Island from the air, on their way to or from LaGuardia Airport. A visually compelling and distinctive bird's eye view seeks to communicate the island's transformation from a penal colony to an innovative, green climate hub.

Environmental Performance and Climate Adaptation

Existing Topography



Proposed Topography



Relocating critical infrastructure on Rikers Island will enable the City to undertake a comprehensive approach to resiliency planning. This is favorable to the alternative of adapting existing structures in Queens and the South Bronx in a parcel by parcel, piecemeal fashion. The latter will likely be more costly, ineffective, and could potentially intensify flooding and other climate vulnerabilities on nearby populations.

In this plan, the regrading of topography elevates all sensitive infrastructure including the WRRF, research campus, battery farm, and waste processing facilities above the 2100 100-year flood line, which is marked by the 20 foot contour line. The construction of three interconnected mounds in the east produces a large south sloping lawn where efficiently spaced solar photovoltaics can exploit the southern solar exposure.

Water Management

Planting

The grade change on the eastern side of the island will foster ecological diversity and enable a natural drainage system to replace a traditional engineered one where swales collect runoff and guide it to on-site retention ponds and coastal buffer zones. This strategy eliminates the investment cost of underground storm pipes and drain inlets and limits excavation in the east, an area likely subject to greater coal ash discards that presents exposure risks to polycyclic aromatic hydrocarbons (PAHs).

The planting strategy assumes the probability of polluted soils. Hardy species with low maintenance requirements will be selected for their ability to uptake contaminants, sequester carbon, reduce erosion and runoff, and boost soil fertility. A coastal buffer of wetlands and mixed woodlands would ameliorate storm surge intensity. Swales and meadows create a large buffer rim around the impervious areas of the battery farm and composting site to capture and filter water, and contribute to the overall aim of urban heat island effect reduction.

Research and Training

The institute's research and training programs can dovetail with a range of ongoing climate justice initiatives.
[A] Solar photovoltaic installation and [B] worker training at WE ACT for Environmental Justice. Photos used with permission.
[C] Testing soil for contaminants and [D] examining the soil microbiome at the Urban Soils Institute. Photo courtesy of USI.

A future research and training institute at Rikers is integral to the aim of repairing the social and environmental injustices to communities most harmed by mass incarceration and systemic racism. Individuals leaving incarceration currently face enormous barriers in accessing full-time employment and other supportive services needed for regenerative integration within the surrounding communities. Designed in collaboration with the populations most impacted by Rikers, the institute will enable front-line communities to cultivate the education, skills, and tools necessary to become key stakeholders in the City's climate transition.

A range of partners will support the campus's services and programming. For example, a CUNY branch could leverage the infrastructure on the island for applied research in the renewable energy and resource recovery sectors. Additionally, workforce development would ideally involve a number of nonprofit organizations active in restorative justice programming and advocacy.

Energy Research and Solar Installation

Solar installation is one of the fastest growing occupations in the country with 52% job growth expected by 2030.[5] The institute at Rikers will provide career pathways in solar installation, repair and recycling and research opportunities in emerging technologies, such as quantum dot solar cells and energy storage technologies. These innovations can be layered into training modules developed by the anchor institution's engineering departments.

Resource Recovery and Urban Soils

Composting generates four times as many jobs as linear disposal systems and supports additional job growth in each phase of the organics recovery cycle.[6] An urban ecology arm of the Institute will train individuals in organics recycling and serve as a soil and plant laboratory for testing the various amendments, fertilizers, and biosolids produced on Rikers.

Green Workforce Development

The institute will provide training in technical and soft skills for entering into a range of green occupations. Additional instruction will be tailored toward entrepreneurship and cooperative business ownership models. The skills gained on Rikers stand to positively transform and create employment opportunities in the impacted communities.

5. U.S. Bureau of Labor Statistics. 2022,"Solar Photovoltaic Installers: Occupational Outlook Handbook:U.S. Bureau of Labor Statistics," April 18, 2022.

6. BioCycle, "State of Composting in the U.S," July 16, 2014.

Reclaiming History at Rikers Island

Mass Story Lab event about Rikers Island. Photo by Create Forward, used with permission.

The lack of documented history on Rikers Island is both a challenge and an opportunity. On the one hand, it highlights the possibility that the horrors of Rikers will not remain in our collective memory, thus risking that those injustices will be repeated and relived. On the other hand, it offers an opportunity for those most impacted by Rikers to reclaim that history for themselves.

The Renewable Rikers plan contributes to the process of collective remembering. A small visitor center and marker at the base of the bridge would document and bear witness to the painful history that soaks the soil. More essentially, the physical markers would ground visitors in the broader, decentralized public education and community truth-telling efforts that seek to ensure that Rikers memory is shaped by the lived experiences of the people who have been harmed there.

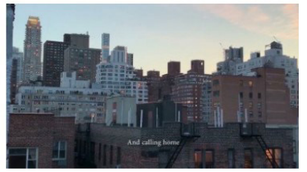
The Rikers Public Memory Project is one such participatory initiative that has begun conducting audio interviews and collecting oral histories of those who have been detained at Rikers, their families, and those who work there. These stories will be catalogued as a part of the permanent collections of the New York Public Library. This is just the beginning of an ongoing and dynamic process that uses public memory in pursuit of reparative justice for the communities that bear the mounting cost of mass incarceration.

Rikers Culture

Rikers Culture

They Don't Care

Medical Care/Neglect



Lifelines

Lifelines

After Leaving Rikers

After Rikers

They treat you like you're nothing

Correction Officers

I Was Violated Too

Family/Visitation

Stolen innocence – Youth in Rikers

Youth in Rikers

Alone

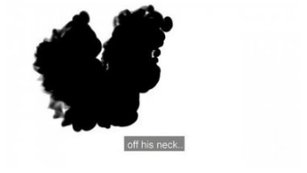
Solitary Confinement

One Voice Closing Rikers

Closure/Remembrance

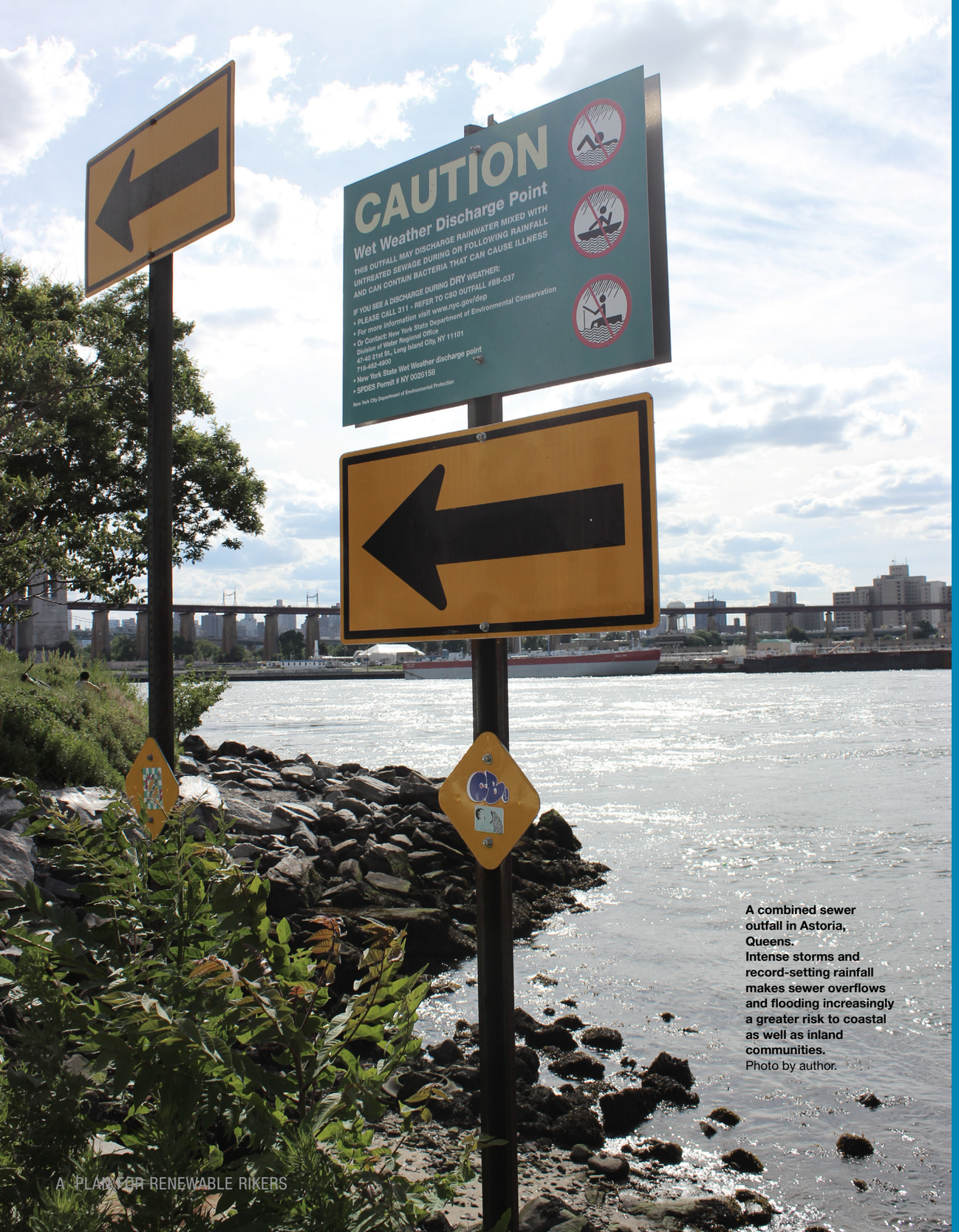
First day on Rikers Island

And You're On Rikers Island



I Didn't Come in there an Animal

Digital Storytelling Collection from Rikers Memory Project. https://rikersmemoryproject.org/

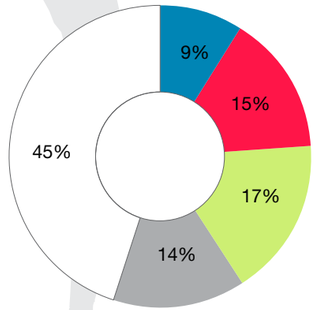


A combined sewer outfall in Astoria, Queens.
Intense storms and record-setting rainfall makes sewer overflows and flooding increasingly a greater risk to coastal as well as inland communities.
Photo by author.

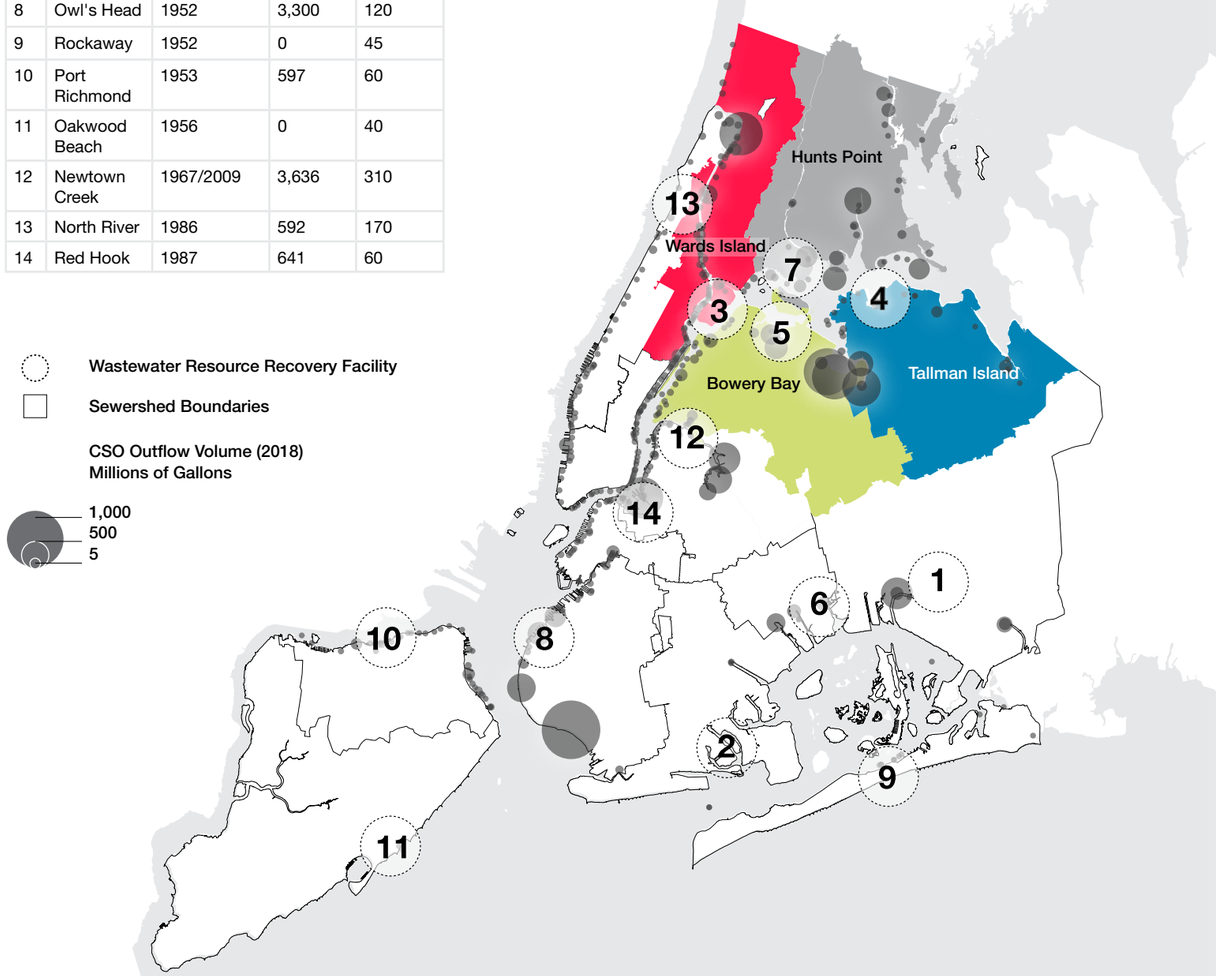
A Renewable Rikers could consolidate four aging wastewater treatment plants with state-of-the-art technology, freeing up to 182 acres for community-determined priorities and cleaning up local waterways.

Existing Wastewater Management

	WRRF	Year Built	CSO Volume 2018	Capacity (MGD)
1	Jamaica	1903/1943	1,325	100
2	Coney Island	1935	0	110
3	Wards Island	1937	3,561	275
4	Tallman Island	1939	2,112	80
5	Bowery Bay	1939	4,178	150
6	26th Ward	1944	782	85
7	Hunts Point	1952	3,381	200
8	Owl's Head	1952	3,300	120
9	Rockaway	1952	0	45
10	Port Richmond	1953	597	60
11	Oakwood Beach	1956	0	40
12	Newtown Creek	1967/2009	3,636	310
13	North River	1986	592	170
14	Red Hook	1987	641	60



Combined Sewer Overflow Volume (2018)



[Right]
Wards Island wastewater plant under construction in the 1930s.
Works Progress Administration, National Archives and Records Administration, public domain 1930s.

Originally built to handle flows more than twice their design capacity, the city's treatment plants are increasingly stretched in their ability to handle wastewater from a steadily growing population and stormwater from more extreme wet weather conditions. This is particularly acute in the four plants being considered for consolidation on Rikers Island—Wards Island, Bowery Bay, Tallman Island, and Hunts Point—which are some of the city's oldest plants in need of repair. However, all four are land-locked and lie within the 100-year floodplain, which make in-situ expansion and upgrades impractical.

One indication of the Rikers adjacent plants being overtaxed is their disproportionate contribution to the city's combined sewer overflow (CSO) volume.[7] While Wards Island, Bowery Bay, Tallman Island, and Hunts Point can together treat up to 705 millions gallons per day—accounting for 40% of the City's total capacity—they are responsible for 55% of the City's total CSO volume, which diminishes local water quality and limits the recreational use of the nearby East River and Flushing and Bowery Bays.[8]

The consolidation of facilities on Rikers will enable DEP to optimize treated flows with innovative technologies that significantly reduce, if not eliminate, CSO events in a combined sewershed that would serve a third of the city's total population. The new plant will be designed to maximize energy efficiency and to recover biogas and biosolids for beneficial reuse, a priority and focus of NYC's Department of Environmental Protection (DEP).

7. CSO events occur during periods of heavy rainfall when a mix of stormwater and untreated sewage discharges directly into the waterways.

8. The volume in millions of gallons of CSO discharged out of outfalls in 2018, as modeled by the Department of Environmental Protection, data compiled by Open Sewer Atlas.

Liberated Space and Waterfront Connections

NYC Department of City Planning Waterfront Access Map, released December 2019

Existing WRRF

Publically owned lot with waterfront access

Privately owned lot with public waterfront access

Pump station

Interceptor Force Main

[A] Energy and wastewater infrastructure limits waterfront access in Astoria. Photo by author.

[B] Pedestrian access from the Bronx to Randall's/Wards Island. Photo by author.

[C] Barretto Point Park is one of only two parks located in Hunts Point, the South Bronx. Photo by Roy Smith via Wikimedia Commons (Creative Commons Attribution 4.0).

Aside from cleaning up the nearby waterways and reducing sewage back-ups on streets, the consolidation also has the potential to free up the formerly occupied WRRF properties, which together total 182 acres, for community redevelopment. The ongoing DEP feasibility study will determine how much space, if any, must be reserved for continued wastewater functions, such as pump stations or wet weather facilities.[9] Of the acres that are ultimately redirected for public benefit, community driven planning processes should determine the best use of land, whether that is open space, affordable housing, green infrastructure, or other functions to meet neighborhood priorities and that take into account sea level rise and localized flood risks.

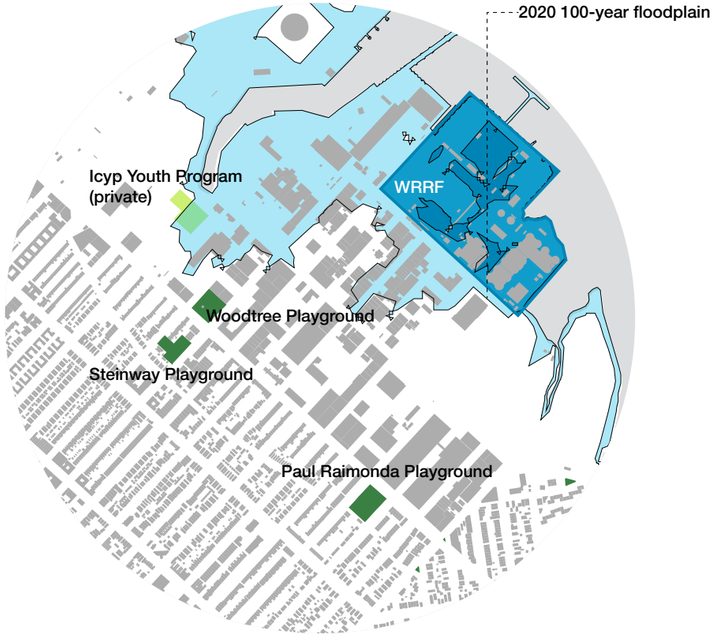
Given that high level storm sewers already connect Bowery Bay and Hunts Point WRRFs to Rikers Island, these plants will likely be the first to be decommissioned. Northern Astoria and Hunts Point are two environmental justice communities that, as the maps on the following page convey, sorely lack open space or community focused facilities—which this plan has the potential to redress. In a second phase, Wards and Tallman Island WRRFs could be retired following the construction and connection of force mains to Rikers Island. This liberated space would expand and create contiguous public waterfront access on Wards Island and in College Point.

9. NYC Department of Environmental Protection. "Request for Proposals for Contract 1553-RIK: Feasibility Study for the Consolidation of NYC Wastewater Resource Recovery Facilities on Rikers Island," May 2021.

Neighborhood Redevelopment and Connections

Bowery Bay
37 acres

Besides a few playgrounds and sports fields, northern Astoria lacks green space and facilities dedicated for public use. The freeing up of 37 floodplain prone acres could be dedicated to a range of community-oriented resiliency uses.

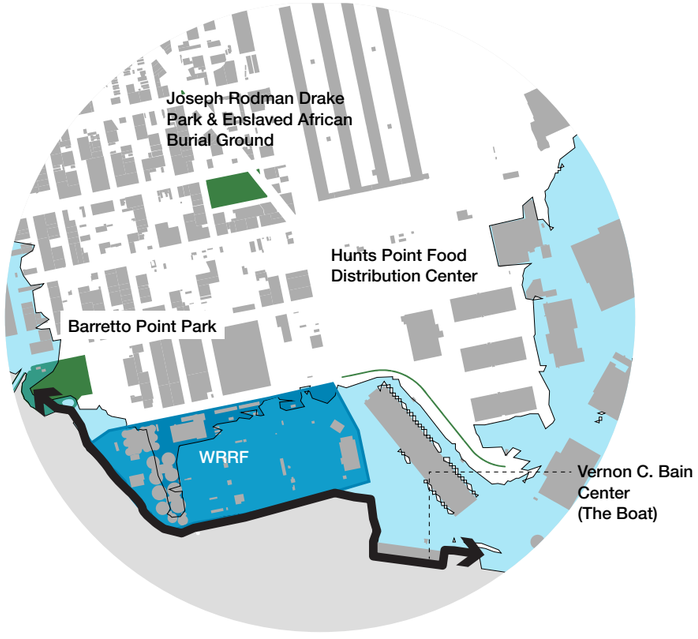


Tallman Island
31 acres

The conversion of the WRRF property in College Point has the potential to create uninterrupted public access along the East River from Hermon A MacNeil to Powell's Cove parks.

Hunts Point
46 acres

The WRRF redevelopment could provide continuous public access from Barretto Point Park, one of Hunts Point's only open spaces, with a future potential connection to Soundview Park via the city-owned land at the Food Distribution Center. The planned closure of the Boat (Vernon C. Bain Center), docked at Hunts Point, will also ensure expanded waterfront access.

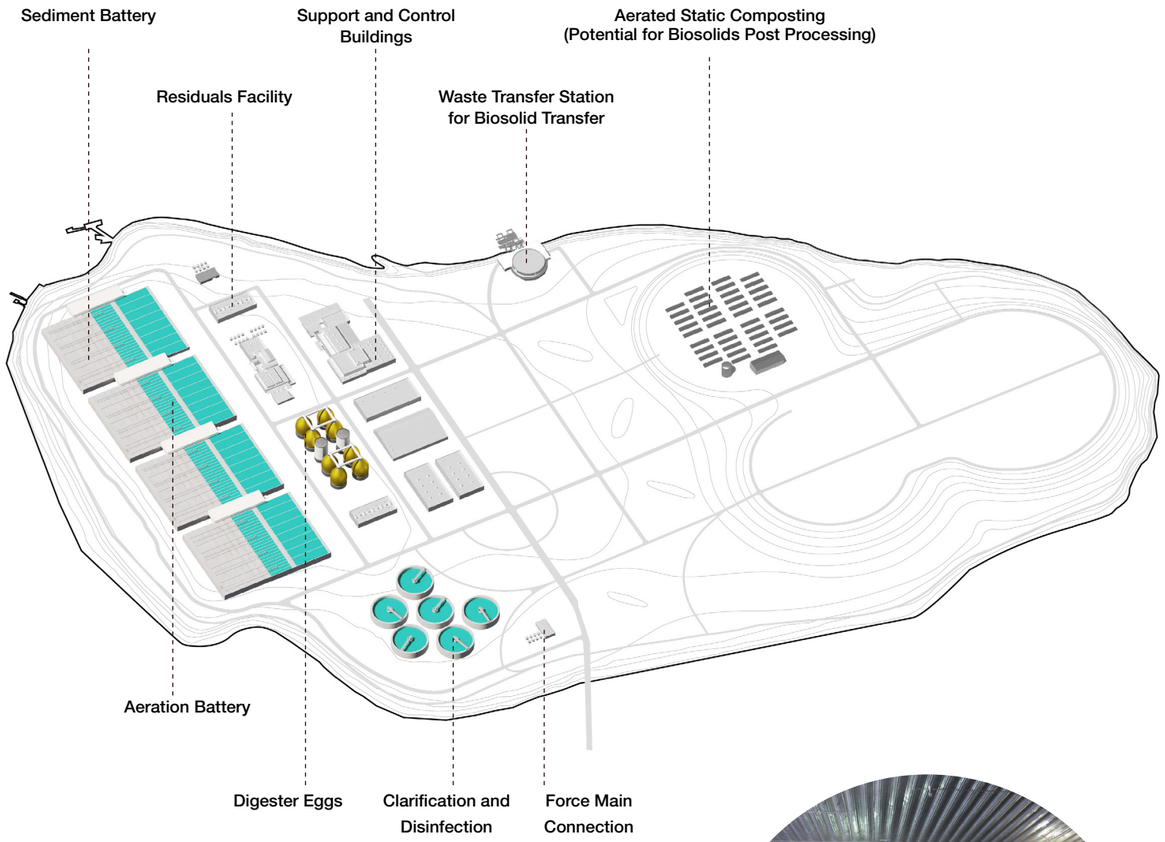


Wards Island
68 acres

The WRRF conversion could grow the city's publicly accessible land holding on Wards and Randall's Island by 68 acres. Unlike Rikers, Wards and Randall's Islands are accessible from the Bronx, Queens, and Manhattan, and are already heavily utilized for recreation and supportive social services.

NYC Department of City Planning Waterfront Access Map, released December 2019

Wastewater Resource Recovery Facility Consolidation



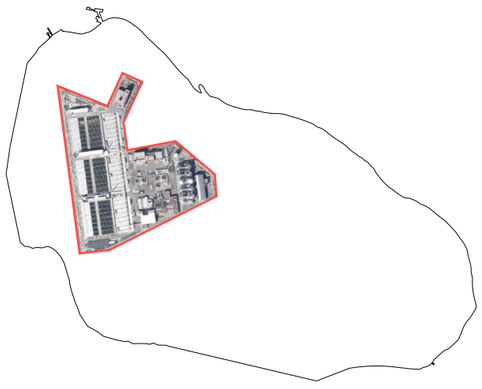
Using DEP's most recent retrofit of Newtown Creek WRRF as a precedent, between 90 to 120 acres would be required to handle 705 MGD, the combined dry weather capacity of the four plants being considered for consolidation. Given the increase in population and more intense wet weather conditions, the plan here expands the area dedicated for wastewater treatment and the recovery of biogas and biosolids for beneficial reuse to 135 acres.

Biosolids are nutrient-rich organic materials that when properly treated can be recycled and utilized as a soil amendment in NYC.
Photo by NYSDEC, used with permission.

[Right]
Newtown Creek, the only WRRF facility with a visitor center and active educational programming, is a model for the consolidated facility on Rikers.
Photo by author.

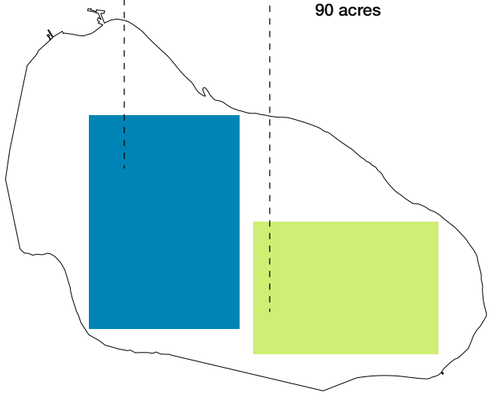
Case Study: Newtown Creek WRRF

310 MGD / 53 Acres
5.8 MGD/ 1 Acre



Consolidated WRRF (705 MGD)
at Newtown Creek Efficiency
120 acres

Consolidated WRRF (705 MGD)
25% greater efficiency than
Newtown Creek
90 acres



A view of the future consolidated Wastewater Resource Recovery Facility. Fertilzers and amendments produced from the digestion process can be tested on soils and plants via the research and training institute.

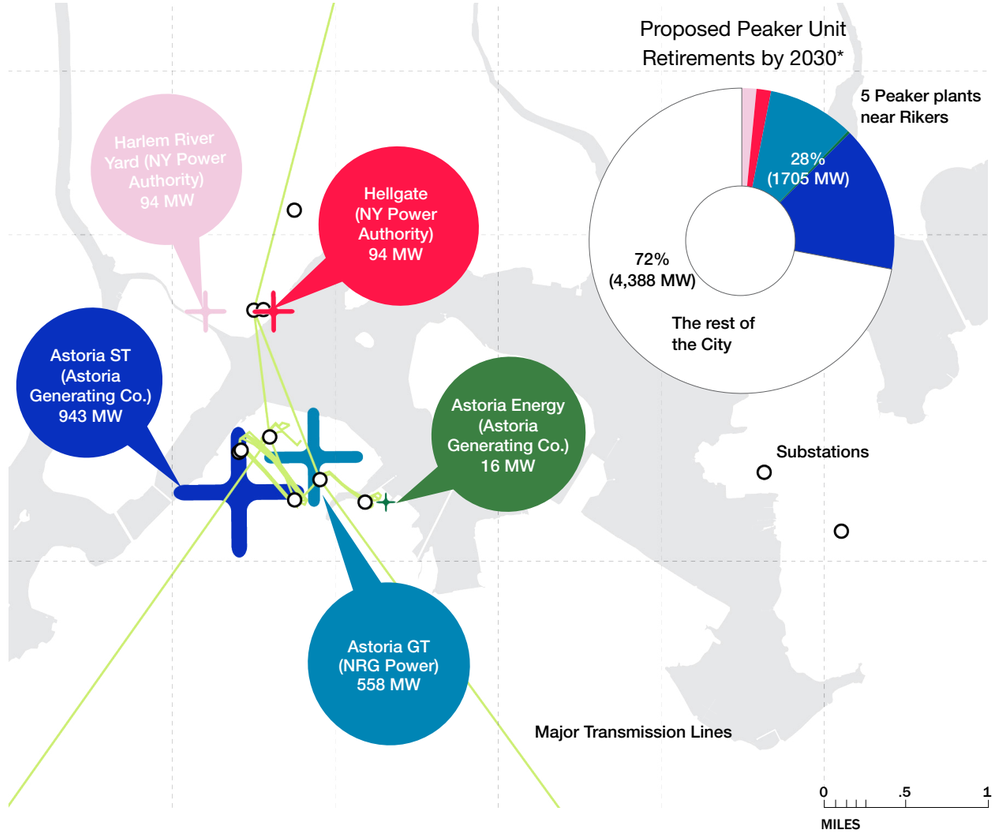
Hellgate Peaker Power Plant spews noxious fumes into the surounding neighborhoods of the South Bronx.
Photo by author.

A Renewable Rikers could generate 1,500 MW of energy storage and 275 MW of solar power. A hub for renewable energy on Rikers could phase out nearby peaker power plants and train residents for jobs in solar installation and repair.

Existing Energy Landscape

The city's peaker power plants, such as Gowanus GT located in Sunset Park, are overwhelmingly located in under-resourced communities of color. Photo by author.

Layer Information for Interactive State Maps, U.S. Energy Information Administration



As the single greatest parcel of available land within the five boroughs, Rikers Island can help the City achieve its 1,000 MW solar and 500 MW energy storage targets,[10] and most urgently, phase out the five nearby gas-fired peaker power plants. The peaker fleet in NYC is aging—many units are over 50 years old including Hellgate and Harlem River Yard—and are maintained solely to supply power to the grid during high demand periods, such as on the hottest and coldest days of the year.[11] Despite their infrequent use, peakers emit exorbitant levels of local pollutants like nitrogen oxide (NoX) and exacerbate health impacts on the surrounding environmental justice neighborhoods. Three privately owned peakers in Astoria, dubbed "asthma alley," along with the two NYPA plants in the South Bronx, are located within two miles of Rikers, making the island an invaluable asset in the City's shift away from fossil fuels.

Adapting large-scale renewables to our antiquated electric grid presents a variety of challenges, including the need to balance supply and demand within existing transmission and distribution load pockets. Astoria East/Corona, with Rikers Island at its center, is one of two constrained load pockets in NYC that is in need of more locally sited renewable energy capacity.[12] Located at the confluence of multiple substations and transmission and distribution lines, Rikers Island's energy hub can ensure that increased reliability is derived from clean energy sources.

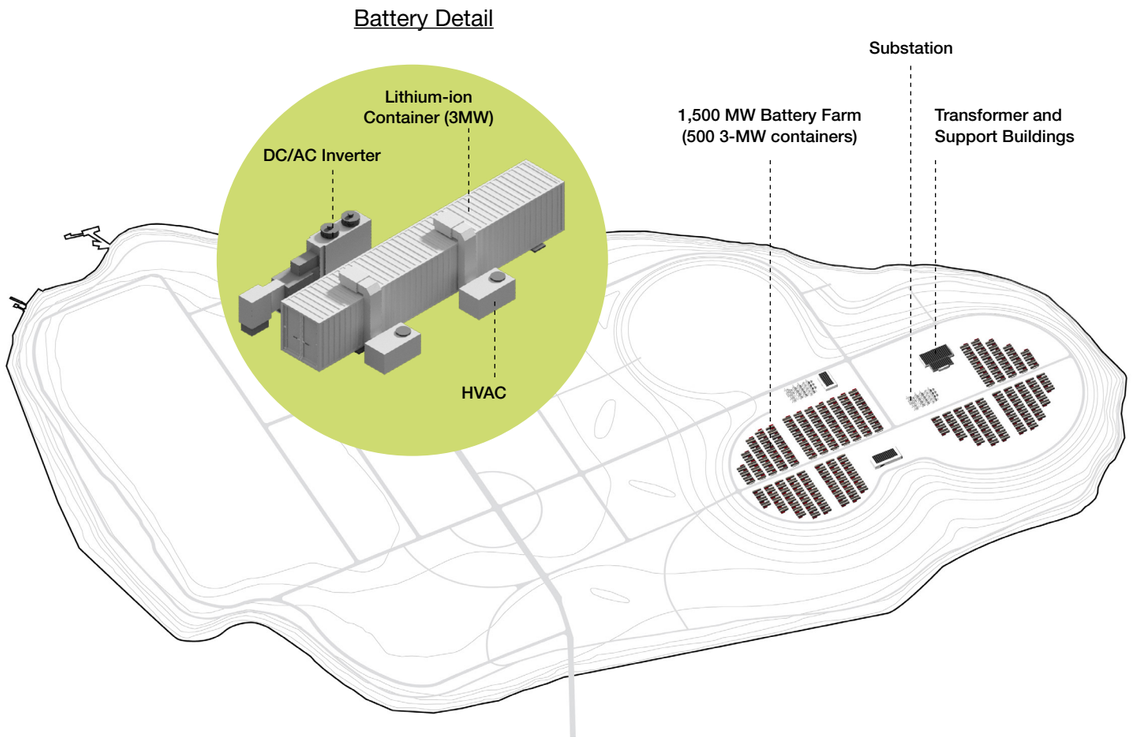
10. NYC Mayor's Office of Climate and Environmental Justice, "Embracing Clean and Renewable Electricity," https://www1.nyc.gov/site/sustainability/achievements/renewable-energy.page

11. The Peak Coalition and Strategen Consulting, "The Fossil Fuel End Game: A Frontline Vision to Retire New York City's Peaker Plants by 2030," March 2021.

12. Ibid.
The boundary feeders for this load pocket include Hell Gate, Astoria Annex, Rainey, and Jamaica substations.

* As outlined by the Peak Coalition in the above-cited report.

Energy Storage



With advancing technologies and market forces, utilities are increasingly opting to replace peaker plants with grid-scale battery farms powered by renewable energy. In what would be the world's largest battery farm, 500 3-MW containers on Rikers can nearly retire the full 1,700 MW capacity from the five nearby peaker plants. Lithium-ion batteries currently supply power to the electric grid for a duration of 4 hours, a good match for replacing many of the City's units that respond to peaking demand discharge at comparable rates.[13] As energy storage technologies and our power grid evolve, investment in a mix of resources with varying durations may better handle the seasonal fluxes of offshore wind and scaled up rooftop solar.

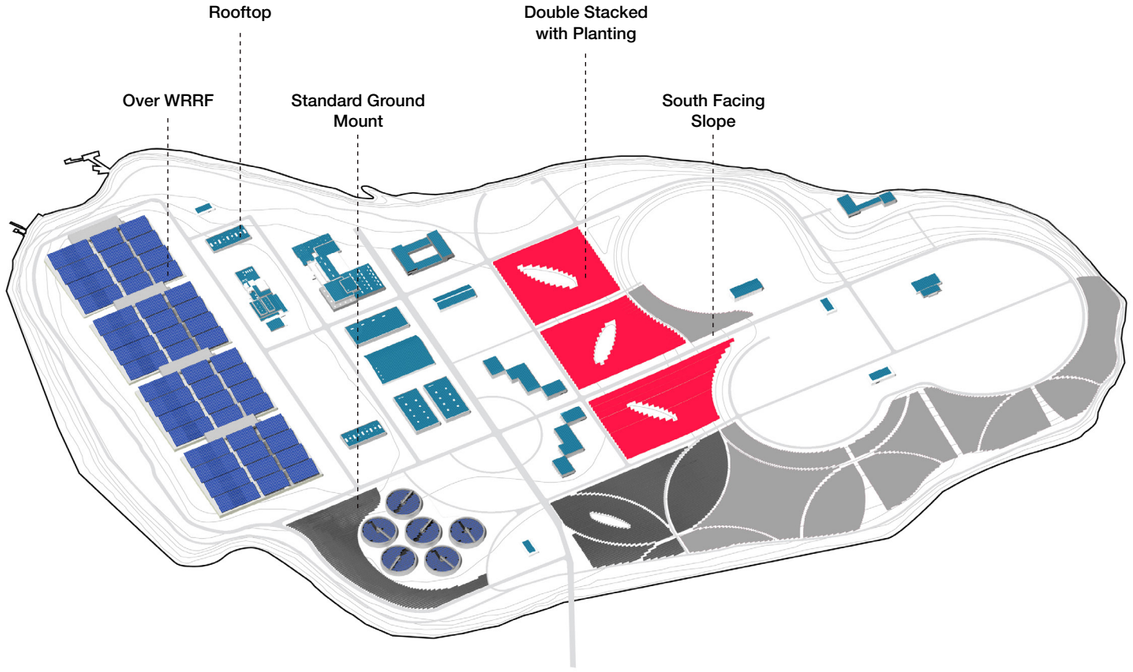
A locally sited hub will also make the City's energy grid more redundant and able to withstand the likelihood of more frequent grid failure. During centralized power outages, the solar pv and battery system on Rikers can operate as a microgrid and provide back-up power to critical facilities on the island and in nearby neighborhoods.

13. The Peak Coalition and Strategen Consulting, "The Fossil Fuel End Game: A Frontline Vision to Retire New York City's Peaker Plants by 2030," March 2021.

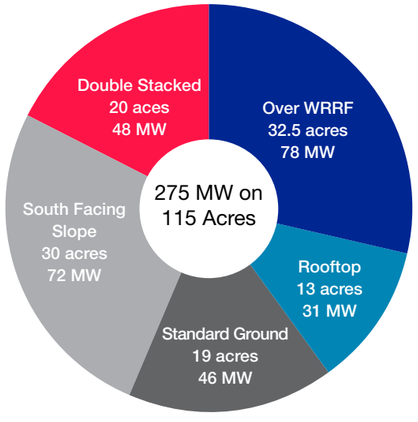
A battery farm in California produces 120 MW hours of energy, enough to power 20,000 homes for 4 hours. The proposed Rikers Island energy storage system would generate over 12 times as much energy. Photo by ImpactNV, used with permission.

Energy Generation

Solar PV Production



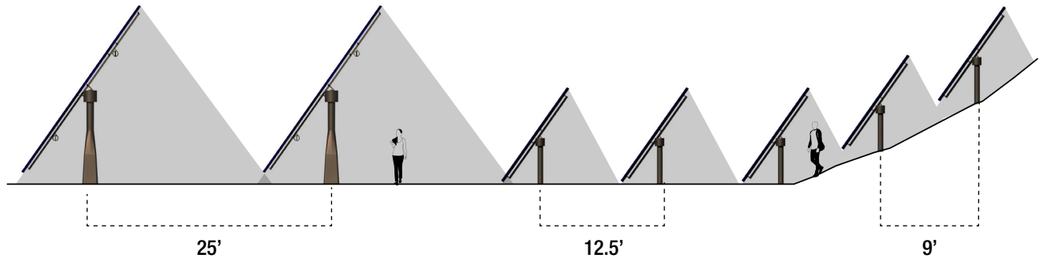
A Mix of Solar Typologies



Using about one fourth of the island's land area, a 275 MW solar farm would almost double the city's current solar production[14] and help to offset the high electricity demand of wastewater treatment. Various solar typologies capitalize on synergies with other uses on the island, including covering the WRRF aeration and sedimentation tanks with solar canopies and double stacking panels to allow for greater spacing and multistory plantings. A diversity of ground-mounted and rooftop based photovoltaic systems will also support the institute's training curriculum in solar installation and maintenance.

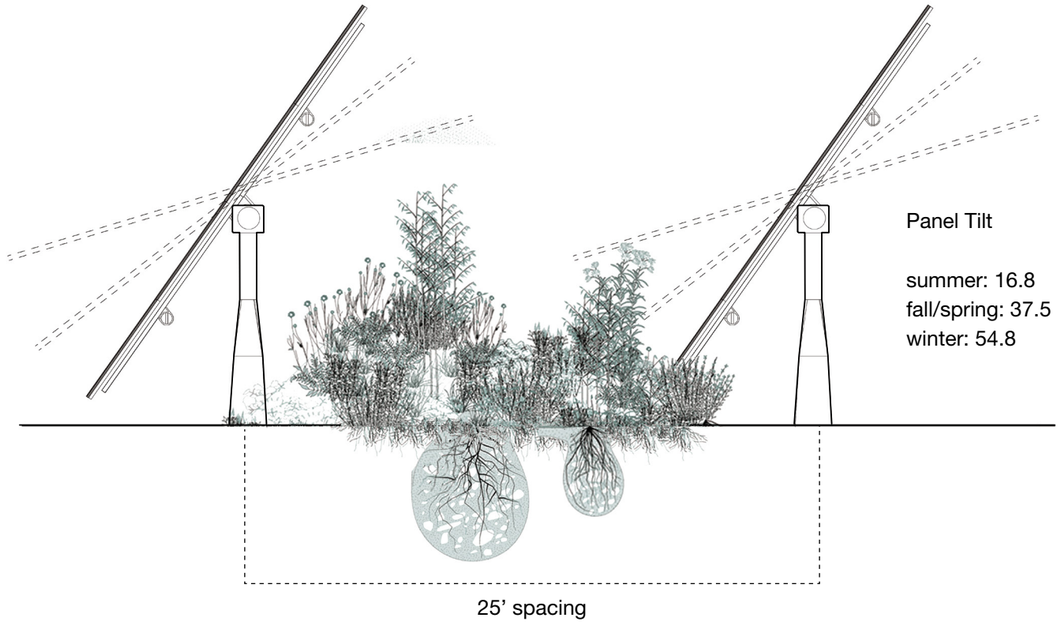
14. NYC has an installed capacity of 302 MW as of March 31, 2022. New York State Energy Research and Development Authority Solar Electric Programs. Via https://nysolarmap.com/.

Solar Spacing Varies by Unit and Grade



Higher density
(South facing slope)

Solar with Multistory Planting



A view of the battery farm with stacked solar panels spaced to promote soil building, water capture, and heat reduction.

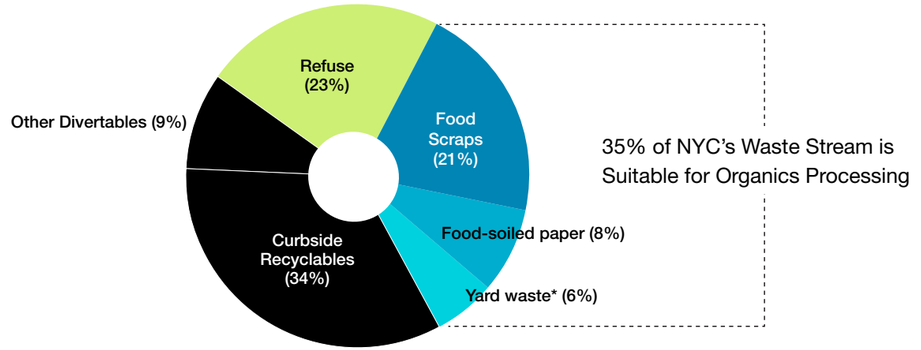
DSNY trucks at the Harlem River Yard Transfer Station. Circuitous truck traffic and waste transfer stations are over-concentrated in neighborhoods surrounding Rikers Island.
Photo by author.

A Renewable Rikers could process over 365,000 tons of organic waste per year, 34% of NYC's total organic waste stream. A recycling hub could generate green jobs, remove polluting trucks from the road, and activate urban ecologies.

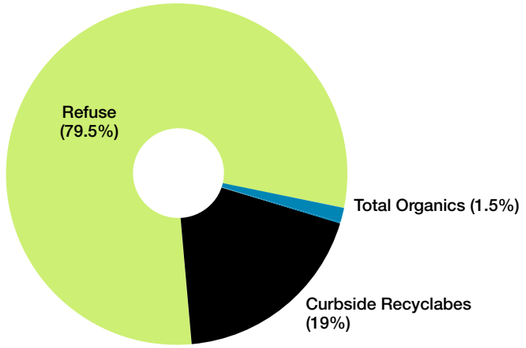
Existing Waste Management

The new 91st Street Marine Transfer Station can barge organics to the hub at Rikers Island. Photo by author.

Municipal Solid Waste Composition



Municipal Solid Waste Collection



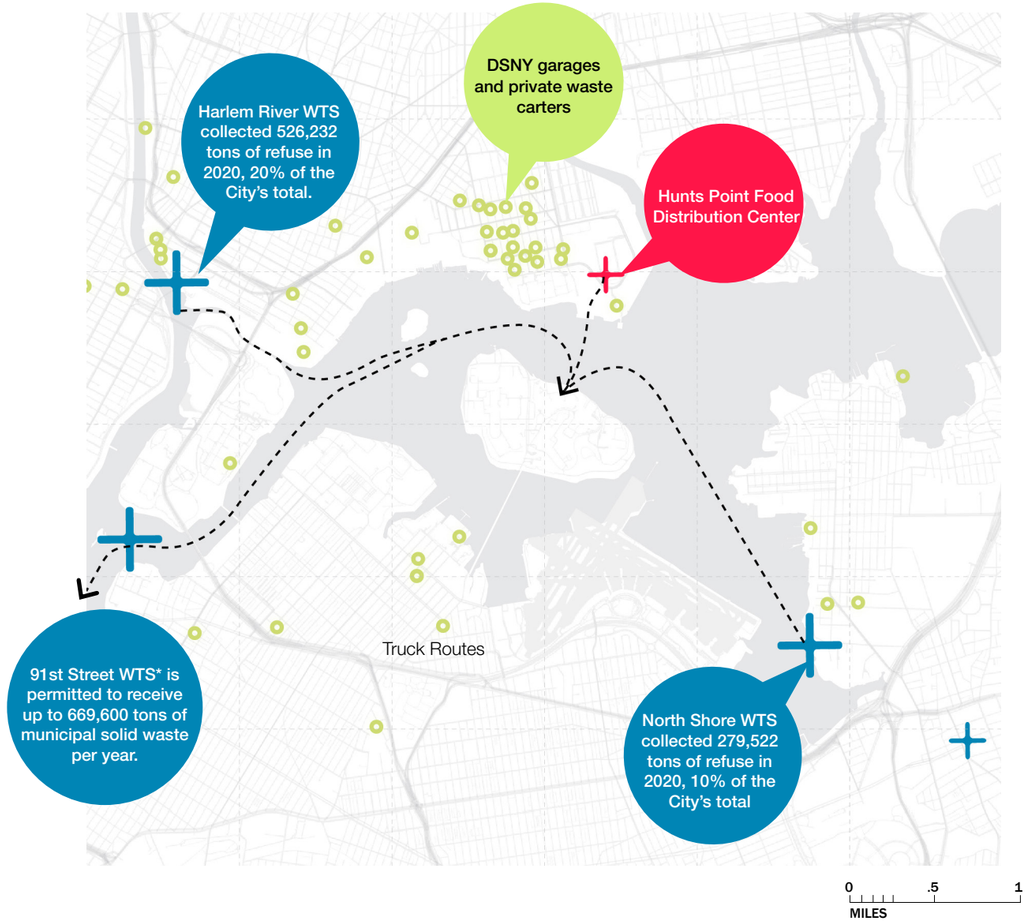
15. NYC Department of Sanitation, "2017 NYC Residential, School, and NYCHA Waste Characterization Study," 2017.

16. 155 tons per day were diverted for organics recycling out of a total volume of 12,056. NYC Department of Sanitation, "Annual Report New York City Municipal Refuse and Recycling Statistics," 2019.

[Left]
"DSNY Monthly Tonnage Data," Open Data NY.
Refuse: compiled total tons collected for 2020 by community district.
Organics includes curbside, DOE, x-mas trees, and yards scraps for 2019 (organics collection were suspended in 2020).
This map only considers primary flow sites, not secondary ones.

In 2017, the last year the City conducted a comprehensive waste composition analysis, organics comprised over one third of the total residential waste stream.[15] Two years later, DSNY statistics reveal that a mere 1.3% of municipal solid waste (or 3.7% of the total organic stream) was collected for recycling.[16] In short, despite progress made by the Curbside Composting program, the majority of the city's food scraps and yard waste still ends up at landfills and incinerators as far as Ohio and South Carolina. Even source separated organics take circuitous routes through low-income neighborhoods—overburdening them with odor, noise, air pollution, and congestion—whose final destination can even be composting facilities outside of the City. An organics hub at Rikers offers a corrective to this inefficiency and fills a gap in much needed processing capacity within the five boroughs.

Processing Hub and Technologies



Rikers Island is situated at the nexus of three major marine waste transfer stations—Harlem River, 91st Street, and North Shore which together handle over 30% of the city's solid waste.[17] By constructing a waste transfer station on Rikers, food scraps and yard waste will be transported there via barge from the existing stations, reducing truck traffic in nearby residential neighborhoods. In future years, Rikers may also begin to accept the private sector's high-volume and low contamination organic waste streams. Recent legislation requires more businesses to separate their organics and the consolidation of a slew of private carters located in the South Bronx could streamline organic procesing at Rikers.[18] In addition, the island could receive unsalvageable biodegradables from Hunts Point Food Distribution Center, a short barge trip across the East River.

17. "DSNY Monthly Tonnage Data," Open Data NY, for 2020.

* With its recent opening, 2020 data for the 91st Street Station was incomplete. The facility has the the potential to collect up to 1,860 tons of municipal solid waste (MSW) each working day. Mallory Szczepanski, "An Exclusive Look at the 91st Street Marine Transfer Station in New York," Waste 360.com, May 23, 2019.

18. Int 1162-2013 requires that certain food establishments and retail food stores recycle their organics.
LL199 of 2019 requires the establishment of Commercial Waste Zones throughout NYC.

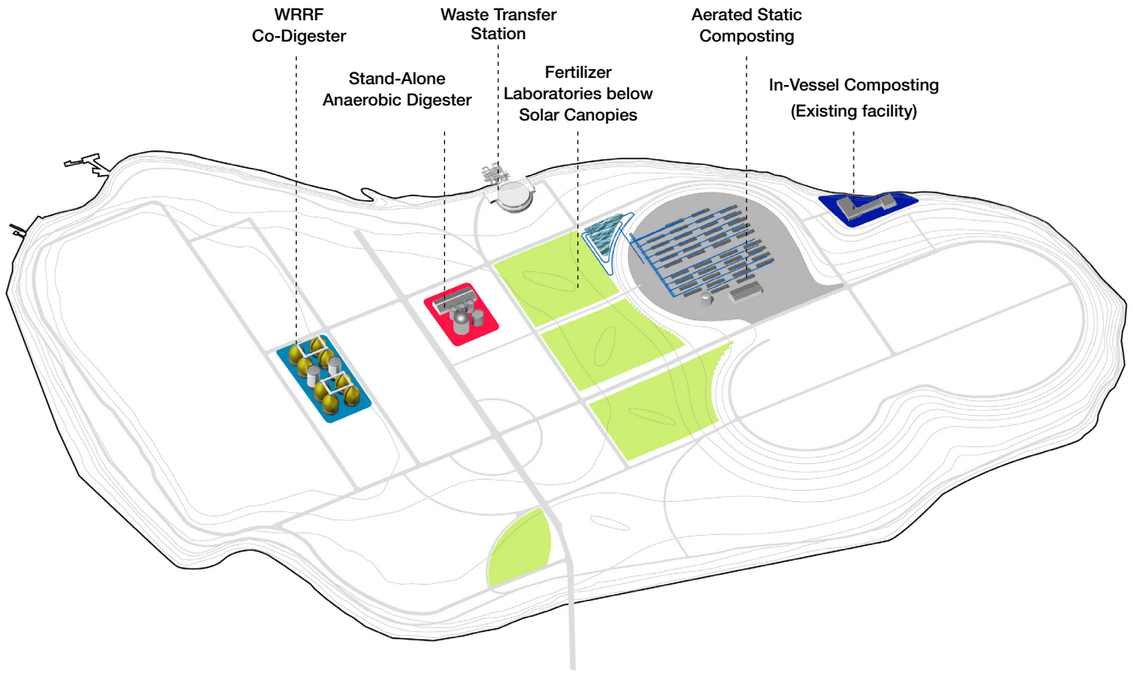
Proposed Organic Waste Processing Technologies

Newtown Creek WRRF co-digester has a capacity to process 500 tons of food scraps per day.
Photo by author.

Aerated composting at Mid Valley Disposal Project.
Photo by Sustainable Generation, used with permission.

A stand-alone anaerobic digester.
Photo by NYSDEC, used with permission.

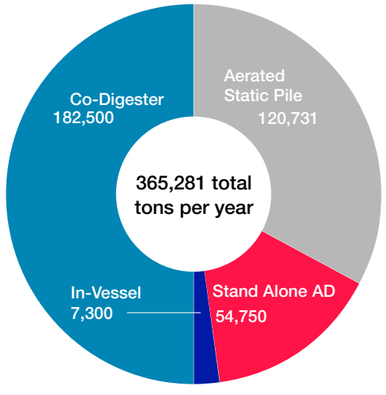
Organic Waste Recycling



Investing in a range of organics processing facilities will add a level of redundancy and allow the organics hub to be scaled up in a phased manner. The existing in-vessel composting facility is already in operation and will immediately be equipped to receive municipal organic waste at the time of the jail closure. When the WRRF co-digester, which has the greatest processing capacity, goes online, it will combine with aerated static composting and a stand-alone anaerobic digestion facility to process almost 35% of the municipal organic waste stream.

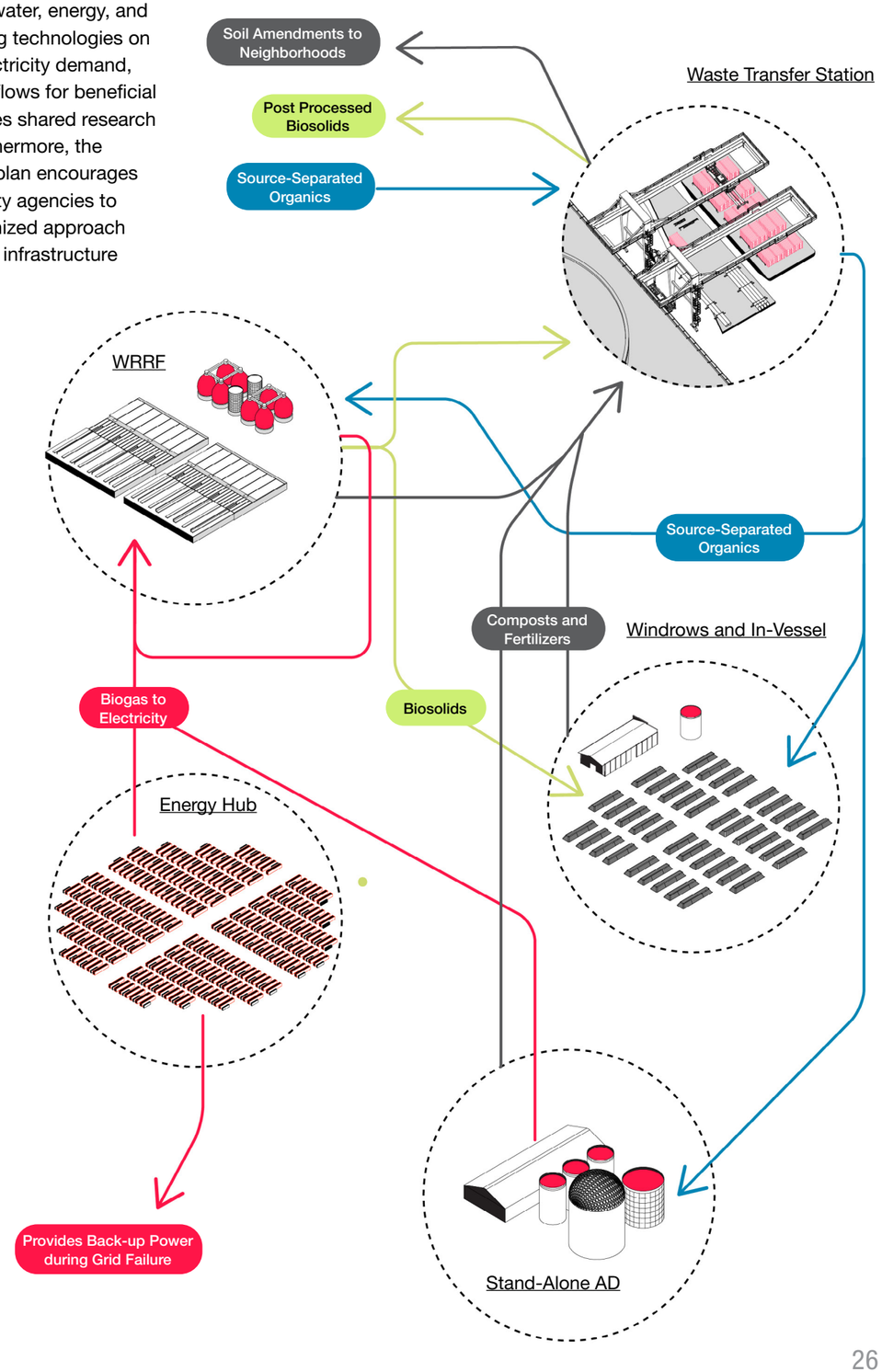
Each of these technologies operate under distinct conditions and together will produce a desirable mix of soil amendments, including compost, fertilizers, and biosolids that can be used to restore soils in City parks, streets, community gardens, brownfields, and coastal resiliency projects. The Research and Training Institute will instruct individuals in a variety of urban ecology realms and will serve as a laboratory for testing amendments for their ability to retain nitrogen, sequester carbon and infiltrate water, among other properties.

Processing Capacity Ramps up Over Time



Closed Loop Rikers

Co-locating wastewater, energy, and organics processing technologies on Rikers reduces electricity demand, recirculates waste flows for beneficial reuse, and leverages shared research opportunities. Furthermore, the Renewable Rikers plan encourages frequently siloed city agencies to develop a synchronized approach to climate adaptive infrastructure planning.



A view of the marine waste transfer station, a hub for organic waste exchange and processing.

Appendix

Technologies and Production Capacities

		CAPACITY
Energy Production and Storage	Solar PV Production	Considering 14.6 MW on 35 acres (or 2.4 MW/1acre) [19] Rooftop = 13 acres Over WRRF = 32.5 acres Land Based= 69 acres Total acreage = 114.5 x 2.4 MW = 275 MW potential energy production per year
	Battery Farm	Considering Engie's battery module is equal to 3 MW [20] 500 battery units = 1,500 MW battery storage per year
Organics Processing	In-Vessel Composting (existing on Rikers)	7,300 tons per year on 1.5 acres [21]
	Stand-alone Anaerobic Digester	Considering Quantum Biopower's processing capacity of 150 tons of food waste per day on 2 acres [22] = 54,750 tons per year on 2 acres
	Co-Digester	Considering Newtown Creek WRRF's potential to process up to 500 tons of organic food waste per day [23] 500 tons of organics waste per day = 182,500 tons per year
	SG Bunker® System with GORE® Covers	Considering Sustainable Generation's Fresh Kills facility, which will process 60,000 tons per year using 16 Bunkers, 164 ft. x 27 ft. x 12 ft [24] Rikers: 44 Bunkers, 120 ft x 27 ft x 12 ft = 120,731 tons per year

19. Sustainable CUNY of the City University of New York, "Rikers Island Solar + Storage System Options," January 22, 2020.

20. Engie Developments Ireland, "Kellistown Energy Storage Volume 1 - Supporting Statement", November 2018.

21. In 2012, Rikers Island in-vessel facility received 20 tons of food waste per day from 17,000 inmates and 7,000 officers. The New York City Department of Sanitation, "LL42: A 2012 Assessment of Composting Opportunities in NYC," 2012. https://dsny.cityofnewyork.us/wp-content/uploads/2017/12/about_2012-assessment-of-composting-opportunities_0815.pdf

22. Jesse Buchanan, "Southington plant ready to turn food waste into energy," *Record-Journal*, November 16, 2016. https://www.myrecordjournal.com/news/southington/southingtonnews/9607972-154/southington-plant-ready-to-turn-food-waste-into-energy.html

23. NYC Department of Environmental Protection, Press Release "City Announces Innovative New Partnerships That Will Reduce the Amount of Organic Waste Sent to Landfills, Produce a Reliable Source of Clean Energy and Improve Air Quality," December 19, 2013. https://www1.nyc.gov/html/dep/html/press_releases/13-121pr.shtml#.YngEq-jMJD8

24. Sustainable Generation WeCare DSNY Staten Island Compost Facility Profile https://sustainable-generation.com/project-profile/wecare-dsny-staten-island-compost-facility/

About Us

The Renewable Rikers Coalition

is composed of the core member organizations: Urban Justice Center Freedom Agenda, New York City Environmental Justice Alliance; Natural Resources Defense Council, A More Just NYC and New York Lawyers for the Public Interest.

Regional Plan Association

is an independent, non-profit civic organization that develops and promotes ideas to improve the economic health, environmental resiliency, and quality of life of the New York metropolitan area. We conduct research on transportation, land use, housing, good governance, and the environment, and advise cities, communities, and public agencies.

Some of the region's most significant public works, economic development and open space projects have their roots in RPA ideas and initiatives, from the location of the George Washington Bridge to the revitalization of downtown Brooklyn, Stamford, and Newark to the preservation of open space and development of parks in the Palisades, Governors Island and Gateway National Recreation Area. RPA has pursued these goals by conducting independent research, planning, advocacy, and vigorous public-engagement efforts. Every year, leaders and professionals from government, business, and civic groups debate the region's most pressing challenges at RPA's spring conference, the Assembly. A cornerstone of our work is the development of long-range plans and policies to guide the region's growth. Since the 1920s, RPA has produced four landmark plans for the region. The most recent was released in November 2017.

Andrea Johnson

is researcher, designer and educator whose work explores the intersection of urban landscape infrastructure, socio-environmental flux and climate uncertainty. As the former research director at Terreform Center for Advanced Urban Research, she coordinated numerous publications including a speculative proposal for NYC's food systems, with strategies ranging from adaptive agricultural practices to local waste processing. Johnson's ongoing research explores the role of design in distributive energy systems as a catalyst for social and environmental justice. She is an Assistant Professor in the Master of Landscape Architecture program at the Rhode Island School of Design. Before joining RISD's faculty, Johnson taught at The City College of New York's Spitzer School of Architecture, where she is also an alumna.

About the J. M. Kaplan Fund

Established in 1945 by philanthropist and businessman Jacob Merrill Kaplan, the Fund has since its inception been committed to visionary innovation. Over its 75-year history, the Fund has devoted $250 million to propel fledgling efforts concerning civil liberties, human rights, the arts, and the conservation and enhancement of the built and natural worlds.

With generous support from The J. M. Kaplan Fund, Regional Plan Association has established an endowed chair in honor of Richard Kaplan, a long-serving board member, inspiration, and friend. The Richard Kaplan Chair for Regional Design provides dedicated resources for a prominent urban designer to pursue innovative research and creative planning for the New York metropolitan region.

During his long association with RPA, Richard Kaplan supported diverse projects, from the seed money to create the Alliance to Rebuild Downtown New York and the Governors Island Alliance to a fact-finding trip to Copenhagen for the City's Planning Chair and DOT Commissioner which yielded bold plans to remake New York City's streets and public spaces for pedestrians and bicyclists. Richard's devotion to outside-the-box thinking, his towering ambitions, and his willingness to challenge the status quo has and continues to inspire RPA's design initiatives in the tri-state region.

Acknowledgments

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