

AGZA Green Zone® Tools for Townwide Expansion

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SUMMARY

The Town of Southampton is working with Quiet Communities and the American Green Zone Alliance (AGZA) to expand its AGZA Green Zone® program. An AGZA Green Zone is a defined area of land on which all routine maintenance is performed with battery electric equipment and/or manual tools. This initiative presents an opportunity to substantially reduce toxic pollution, noise, waste and greenhouse gases by transitioning maintenance of its municipal lands to zero-emission low-noise equipment, to the fullest extent advanced battery technology allows. In doing so, the Town will improve worker and public health as well as environmental quality, consistent with the action goals of the Town's Sustainability Plan.

A baseline analysis of impacts from gas-powered equipment used by the Town's Parks and Recreation Department on 56 municipal properties (e.g., mowers, blowers, trimmers, saws) and a GIS-based map were created to provide tools for demonstrating reductions achieved as the Town transitions to battery electric tools. The baseline results are shown in the table below.

Total Annual Impacts of Gas-Powered Equipment Used to Maintain 56 Municipal Properties*

Category	Impact of Gas Equipment
Toxic and carcinogenic exhaust emissions (non-methane hydrocarbons, nitrogen oxides, carbon monoxide, fine particulate matter)	140,082 pounds (70 tons)
Greenhouse gas (carbon dioxide)	449,622 pounds (225 tons)
Noise	1.5 million decibel-hours
Fuel spillage (from re-fueling equipment)	433 gallons (range:117 to 784)
Fuel consumption and cost	14,240 gallons gasoline
Fuel cost (gas only)	\$35,600
Toxic and solid waste	Ongoing waste related to replacement and disposal of gas parts and gas maintenance

*Does not include wing mowers, Sandpro, wheeled blowers, or leaf vacuums.

Routine Maintenance accounts for the vast majority of impacts.

Of the 56 properties evaluated, four parks account for around 30% or more of each of the impacts. Prioritizing the expansion of the Green Zone to these parks would have an immediate and substantial impact.

- Good Ground Park
- North Sea Community Park
- Hampton West Park
- Southampton Meadows Park

In addition to a town-wide AGZA Green Zone expansion, the Town recently passed Resolution #2019-408 (March 26, 2019) to replace gas-powered handheld tools with battery electric counterparts. Implementing the Resolution would result in the reductions below.

Resolution #2019-408: Potential Impact Reductions

Category	Reductions Achievable by Replacing All Gas Handheld Tools
Toxic and carcinogenic exhaust emissions (non-methane hydrocarbons, nitrogen oxides, carbon monoxide, fine particulate matter)	15,140 (8 tons)
Greenhouse gas (carbon dioxide)	44,352 (22 tons)
Noise	~1.3 million decibel hours (does not include Spring/Fall Clean-Ups)
Fuel cost (gas only)	\$6,906 (does not include Spring/Fall Clean-Ups)
Toxic and solid waste	100% elimination of ongoing waste related to replacement and disposal of gas parts and gas maintenance

*Does not include wing mowers, Sandpro, wheeled blowers, or leaf vacuums

Both the baseline analysis and interactive GIS map provide the Town with the tools it needs to document and communicate the benefits of the transition away from gas-powered equipment and demonstrate itself as a regional and national environmental leader.

I. INTRODUCTION

The Town of Southampton is working with Quiet Communities and the American Green Zone Alliance (AGZA) to expand its AGZA Green Zone® program town-wide, transitioning maintenance of its municipal lands away from gas-powered equipment to advanced battery electric equipment to the degree technology allows. The program is intended to improve health, environmental quality, and quality of life for staff, residents, and visitors, consistent with the action goals of the Town's Sustainability Plan. This project:

- Creates a baseline of impacts from maintaining Town lands entirely with gas-powered equipment and a tool with which to measure progress as the transition rolls out across Southampton.
- Provides a tool for measuring reductions in impacts as the Town transitions to more battery electric maintenance practices;
- Identifies high priority properties for AGZA Green Zone expansion and associated impact reductions;
- Estimates impact reductions that will result from implementing Resolution #2019-408 -- replacing gas handheld tools with battery electric counterparts;
- Provides an interactive GIS-based map of the municipal properties and certified AGZA Green Zones along with their impact reductions.

An AGZA Green Zone is a defined area of land on which all routine maintenance is performed with low noise, zero emissions equipment -- battery electric and manual tools. After nearly a decade of development and refinement in California, the first AGZA Green Zones on the East Coast were created at the East Quogue Village Green in 2017 and Town Hall in 2018.

Health and environmental impact metrics are essential to demonstrating the benefits of the Green Zone program and to prioritizing the properties for further expansion. Quantifying the impacts of maintaining the Town's municipal lands with gas equipment establishes a baseline from which impact reductions can be estimated and progress communicated on a property-to-property basis as Green Zones are established. This includes an interactive town-wide map of all candidate Green Zone properties and their stage of AGZA certification.

II. TECHNOLOGY

Advances in battery technology has enabled the development of zero emissions, low noise battery electric equipment capable of performing at the commercial as well as residential levels. These advances have resulted in equipment that have run times, charge times, and performance that makes it practical and cost-effective when applied to all but the heaviest maintenance work. Currently, lithium battery technology has proven itself to be a comparable alternative to gas powered equipment for 100% of routine commercial grounds maintenance and special tasks:

- Mowing
- String/line trimming
- Hedge trimming
- Debris blowing
- Light to medium tree work

Areas in which gas-powered equipment is still needed include dethatching, aeration, heavy tree trimming, rototilling compacted areas, heavy seasonal workloads and contracted enhancement work requiring heavy machinery.

III. PROPERTY AND MAINTENANCE OVERVIEW

- Town of Southampton - 56 properties maintained by Parks and Recreation Department
- MAP = bit.ly/AGZA_GZ_ToS
- TOTAL PROPERTY AREA = over 800 acres

The gas-powered maintenance equipment currently used by Parks and Recreation grounds maintenance crews to service Town lands:

Routine Maintenance (regular mowing, clean-ups)

- Zero turn riding mowers (e.g., Hustler Z/60SD)
- String trimmers (e.g., Echo SRM-225)
- Backpack blowers (e.g., Echo PB-770H)
- Push mowers (e.g., 21" MTD Yard Machine)
- Sandpro (sports fields; not included in impact metrics)
- Wing mowers (not included in impact metrics)

Spring and Fall Clean-Ups (heavy leaf/debris clean-ups)

- Backpack blowers (e.g., Echo PB770)
- Walk behind blower (not included in impact metrics)
- Leaf vacuum (not included in impact metrics)

Special Tasks (e.g., hedge trimming, tree work, vine trimming)

- Hedge trimmers (e.g., Shindaiwa)
- Chain saws (e.g., Husqvarna 440)
- Pole saws (e.g., Stihl HT-131)

IV. METHODOLOGY

Gas-powered equipment and their usage by the Town's Parks & Recreation Department to maintain 56 properties (see Appendix A) were inventoried to estimate their impacts and potential benefits and to guide the expansion of the AGZA Green Zone program. An interactive online map of the properties was also created to illustrate the properties that account for most of the impacts and to visually track progress.

Town properties maintained by the Parks and Recreation Department were identified and tagged with their addresses and acreage (**see Appendix A**). An inventory of equipment and their frequency and duration of use in maintaining each of the properties was conducted. Activities were categorized as 1) **Routine Maintenance** (56 properties), 2) **Spring and Fall Clean-Ups** (28 properties), and 3) **Special Tasks** (24 properties).

Six impacts of gas operations were evaluated.

1. **Exhaust emissions** were quantified in pounds-per-year using validated equations from the US Environmental Protection Agency. The emissions estimates assumed all equipment are EPA and CARB compliant and have been well maintained. The exhaust emissions included:
 - a. **Non-methane hydrocarbons (HC)**, also known as volatile organic compounds, include benzene, 1,3 butadiene, formaldehyde, and acetaldehyde, all of which are potent carcinogens. Additionally, these compounds combine with nitrogen oxides to form ground level ozone, a cause of lung and heart disease.

- b. **Nitrogen oxides (NOx)** combine with non-methane hydrocarbons in warm season months to form ground level ozone.
 - c. **Carbon monoxide (CO)** is a toxic gas which can harm health when people are in close proximity and which can accumulate in enclosed settings (sheds, trailers) and result in death.
 - d. **Fine particulate matter (PM2.5)** is a cause of cancer, lung disease, heart disease, and premature death.
2. **Carbon dioxide** was quantified in pounds per year. CO₂ is a major greenhouse gas that contributes to global warming and climate change.
 3. **Noise** was quantified in terms of decibel-hours -- the product of the decibel level (loudness) at the operator's ear and the number of hours in use (exposure time). Noise levels of all types of gas equipment may harm workers (if not properly using Town-assigned safety gear), passers-by, and the immediate surrounding community. Chronic loud noise may cause irreversible hearing damage, cognitive and psychological problems, and sleep disruption, and contribute to heart disease and other stress-related disorders. Loud noise is particularly problematic around playgrounds, schools, homes, and offices in which people are working, studying, or simply trying to enjoy themselves indoors or outdoors. Children with autism and people with hearing and sensory deficit disorders are especially vulnerable. Loud noise is also known to disrupt animal communications and decrease biodiversity.
 4. **Fuel spillage** (gallons) was measured as a range. Spillage occurs when equipment is refueled. For handheld equipment, a spillage range of 2 to 8 ounces per re-fueling was assumed; for mowers, a range of 2 to 6 ounces per re-fueling was assumed.
 5. **Fuel consumption** (gallons) **and costs of fuel** (\$) were based on average fuel capacity and consumption rates for each type of equipment. Cost per gallon of gas was assumed to be \$2.50.
 6. **Toxic and solid waste** from maintaining gas equipment (chemicals, solid containers and parts – e.g., spark plugs, air and oil filters, belts, hoses, carburetor cleaner, engine degreasers, etc) are completely eliminated when all fully retired gas tools are replaced by electric alternatives.

To prioritize properties for the AGZA Green Zone expansion, properties were segmented by the percentage of impacts into three or four categories: **High Impact**, **Moderate Impact**, and **Low Impact**. Where helpful, the Low Impact category was subdivided into **Low Impact** and **Very Low Impact**.

To estimate the effect of implementing Resolution #2019-408, equipment was categorized into **Mowers** and **Handheld Tools**.

V. IMPACT RESULTS

The results of the baseline analysis indicate that by expanding the AGZA Green Zone town-wide, Southampton Town has an opportunity to almost entirely eliminate harmful exhaust emissions, greenhouse gases, and environmental damage from fuel spillage and solid and toxic waste. Further, the program will substantially reduce noise levels experienced by workers and dramatically reduce hourly operating costs based on avoided fuel and maintenance costs. Substantial savings will accrue over time.

A. Annual Exhaust Emissions

Toxic and Carcinogenic Exhaust

Gas-powered maintenance emits 140,082 pounds (70 tons) of toxic and carcinogenic exhaust each year when maintaining town properties with gas equipment. This exhaust includes:

- **Non-methane hydrocarbons:** 3,387 pounds (1.7 tons) per year
 - **Routine Maintenance** and **Spring/Fall Clean-Ups** account for 99% (82% and 17%, respectively).
- **Nitrogen oxides:** 447 pounds
 - **Routine Maintenance** and **Spring/Fall Clean-Ups** account for 99% of NO_x (97% and 2%, respectively).
- **Carbon Monoxide** 135,822 pounds (68 tons)
 - **Routine Maintenance** and **Spring/Fall Clean-Ups** account for nearly all CO (97% and nearly 3%, respectively).
- **Fine particulate matter:** 427 pounds
 - **Routine Maintenance** and **Spring/Fall Clean-Ups** account for 97% of PM_{2.5} (75% and 22%, respectively).

Note: The amounts of each emission type are not sufficient to indicate degree of toxicity or carcinogenicity. The potency or strength of the emission in causing disease must also be considered. As a hypothetical example, small amounts of PM_{2.5} may be more toxic than large amounts of ozone.

- Battery electric equipment and manual tools produce no toxic and carcinogenic exhaust emissions.

B. Annual Greenhouse Gases

Gas-powered maintenance produces 449,622 pounds (225 tons) of CO₂ each year when maintaining Town lands with gas equipment. The vast majority (98%) is generated by **Routine Maintenance**.

- Battery electric equipment and manual tools produce no carbon dioxide at point of operation.

C. Annual Noise

Approximately 1.5 million decibel-hours of noise are generated by gas-powered maintenance on Town-maintained properties. **Routine Maintenance** accounts for 85% of the noise.

- AGZA-approved battery electric equipment has been estimated to reduce sound levels by 45% – 70%, relative to gas equipment.

D. Fuel Spillage

Assuming spillage of 2 to 6 ounces for large mowers and 2 to 8 ounces for handheld tools per refueling, it is estimated (on average) that 433 gallons of gasoline (range 117 to 748 gallons) are spilled each year, contaminating soil and water. **Routine maintenance** accounts for approximately 90% of the spillage.

- Battery electric equipment completely eliminates the problem of fuel spillage.

E. Fuel Consumption and Costs

Based on the total hours of use and average gallons per hour for the various pieces of equipment, all grounds maintenance activities account for around 14,240 gallons of gasoline at a cost around \$35,600 assuming a price per gallon of \$2.50. **Routine Maintenance** accounts for the vast majority (98%) of fuel consumption and costs.

- Battery electric equipment does not consume fuel.

F. Toxic and Solid Waste

Maintenance of gas equipment generates substantial amounts of toxic and non-recyclable solid waste: spark plugs, air and oil filters, belts, hoses, carburetor cleaner, engine degreasers, etc

- This waste stream is completely eliminated for all fully retired gas tools that are replaced by electric alternatives.

VI. OTHER IMPACTS

In addition to the environmental and health benefits of transitioning away from gas equipment, there are other important benefits.

- A heightened awareness throughout the community about how the Town of Southampton is creating a more pleasant and sustainable quality of life for its citizens.
- Recognition of the Town as a regional and national leader in zero-emissions, low-noise maintenance, helping to strengthen its reputation as an environmental steward.
- Enhanced ability to engage local landscaping businesses in following the Town's example inspiring further impact reductions.
- Long-term benefits from citizens raising expectations about sustainability in all aspects of their lives: zero-emission residential lawn care, electric or other zero-emission cars, rooftop solar, renewable energy infrastructure, etc.

VII. IMPACT OF TOWN BOARD RESOLUTION 2019-408

Resolution 2019-408 passed by the Town Council on March 26, 2019 calls for replacing all gas-powered landscape maintenance handheld tools with battery electric counterparts. The most important reductions that would occur if only battery electric handheld tools were used are:

- Substantial reductions in toxic and carcinogenic emissions: (nearly 64% of HC and 95% of PM2.5 - both are human carcinogens).
 - If gas handheld tools were still allowed during major Spring/Fall Clean-Ups, those percentage reductions would be reduced to 47% and 73%, respectively.
- A 63% reduction in decibel-hours of noise.
- Reductions of \$13,680 in fuel costs.
 - If gas handheld tools were still allowed during major Spring/Fall Clean-Ups, that amount saved would be reduced to \$6,906.
- Substantial reductions in fuel spilled.

VIII. EXPANSION RECOMMENDATIONS

An effective and efficient town-wide expansion of the AGZA Green Zone involves prioritizing properties with the greatest potential to reduce impacts. Transitioning Routine Maintenance activities first makes good sense because.

- Routine maintenance accounts for the majority of impacts.
- Work production/ performance of battery electric equipment is equivalent/comparable to gas equipment for all routine maintenance tasks while major Spring and Fall clean-ups may still require gas-powered equipment (mainly blowers) to maintain work production (at least in the short term).

Properties categorized as High Impact and Moderate Impact for Emissions and Noise associated with Routine Maintenance are listed below.

Routine maintenance at four **High Impact** properties (below) account for 29% to 41% of toxic/carcinogenic emissions, 29% of CO₂, and 34% of noise impacts (see **Appendices B-C**).

High Impact Properties: At Least 5% of Emission and Noise Impacts

- Good Ground Park
- North Sea Community Park
- Hampton West Park
- Southampton Meadows Park

Creating AGZA Green Zones at these properties will eliminate nearly 20 tons of toxic and carcinogenic emissions each year, 63 tons of CO₂, and nearly 436,000 decibel-hours each year. In addition, the Town will save around \$11,000 per year in fuel costs and avoid spilling an average of 36 and 242 gallons of gasoline each year.

Another twelve **Moderate Impact** properties (below) account for an additional 33% to 41% of toxic and carcinogenic emissions, 37% of CO₂, and 40% of noise impacts (see **Appendices B-C**). Creating AGZA Green Zones at these properties will eliminate an additional 26 tons of toxic and carcinogenic emissions, 84 tons of CO₂, and approximately 511,300 decibel-hours of noise each year.

Moderate Impact Properties: 2% to Less than 5% of Emission and Noise Impacts

- East Quogue Village Green
- Red Creek Park
- Town Hall
- Flanders Riverside Community Center
- Red Barn
- Town of Southampton Child Development Center
- Police Department Headquarters
- John E Berwind Village Green & Historic Beebe Windmill
- Ludlam Ave Park
- Conscience Point Marina
- Trout Pond
- Foster Ave Park
- Big Duck Ranch

X. CLOSING STATEMENT

Southampton is on its way to becoming the first AGZA Green Zone Town in the Eastern US and a leader in sustainable landscape maintenance at local, regional, and national levels. A town-wide expansion of the AGZA Green Zone initiated at the East Quogue Village Green and Town Hall promises substantial benefits for the health of workers, the public and the environment. Further, the Town stands to realize long-term savings accruing from eliminated fuel consumption and reduced maintenance. In addition to healthier working conditions, work crews benefit from recognition and pride in the work they do. Residents benefit from cleaner, quieter neighborhoods, schools, businesses and public spaces. ***Quiet Communities and AGZA applaud the Town for their outstanding leadership!***

Appendix A. Property Inventory*

Property	Hamlet		Property	Hamlet
Animal Control Building	Hampton Bays		Hampton Frontier Property	Hampton Bays
Bauer Storage Barn	Westhampton		Hampton West Park	Westhampton Beach
Bridgehampton Community Center	Bridgehampton		Huntington Crossway Green	Bridgehampton
Flanders Riverside Community Center, Nutrition Center	Riverhead		Iron Point Park	Flanders, Riverhead
Hampton Bays Arts & Crafts Center, SR Shuttle Office	Hampton Bays		John E Berwind Village Green & Historic Beebe Windmill	Bridgehampton
Hampton Bays Court	Hampton Bays		Ludlam Ave Park	Riverside, Riverhead
Hampton Bays Public Safety Building	Hampton Bays		Mecox Bay Park	Water Mill
Hampton Bays Rest Stop and Jone's Road Gateway Park	East Quogue		North Sea Community Park	Southampton
Mulvihill House	Sag Harbor		Old Ponquogue Bridge Fishing Pier	Hampton Bays
Noyac School House	Sag Harbor		Old Ponquogue Marine Park	Hampton Bays
Parks Maintenance Office	Hampton Bays		Peconic River Park	Riverside
Parks & Recreation Maintenance Shop & Storage	Hampton Bays		Pine Neck Marina Preserve	East Quogue
Police Dept Headquarters	Hampton Bays		Red Creek Park	Hampton Bays
Red Barn	Hampton Bays		Reisman Property	Southampton
Squiretown Park (Girl Scout Camp)	Hampton Bays		Southampton Meadows Park	Southampton
Town Hall	Southampton		Trout Pond	Sag Harbor
Town of Southampton Child Development Center	Flanders		Wildwood Lake Park	North Hampton, Riverhead
Westhampton Community Center	Westhampton		East Quogue Methodist Church	East Quogue
Westhampton Railroad Station	Westhampton		Indian Preacher Grave Site	Hampton Bays
Big Duck Ranch	Flanders		North End Graveyard	Southampton
Baird Property	Hampton Bays		North Sea Burial Ground	Southampton
Bay Avenue Marina	East Quogue		Old Noyac Burial Ground	Sag Harbor
Conscience Point Marina	Southampton		Old Southampton Burying Ground	Southampton
East Quogue Village Green	East Quogue		Pleasure Woods Cemetery	Flanders
Emma Rose Elliston Park	Southampton		Westhampton Presbyterian Church	Westhampton
Flanders Memorial Park	Flanders, Riverhead		Hot Dog Beach (Triton Beach)	East Quogue
Foster Ave Park	Hampton Bays		Militia Green	Bridgehampton
Good Ground Park	Hampton Bays		Flagpole at Montauk Highway and Ocean Rd	Bridgehampton

*Includes only town properties actively maintained by Southampton Town Parks & Recreation Department

Appendix B. Percent of Emissions at High and Moderate Impact Properties

High Impact: Properties Contributing 5% or More of Routine Maintenance Exhaust Emissions (N=4)

Property	% Emissions on All Properties				
	HC	NOx	CO	PM2.5	CO2
Good Ground Park	13.1%	9.6%	9.9%	14.5%	9.7%
North Sea Community Park	8.9%	8.6%	8.6%	9.3%	8.6%
Hampton West Park	8.4%	6.0%	6.0%	9.7%	6.0%
Southampton Meadows Park	6.3%	4.5%	4.5%	7.3%	4.5%
Totals	36.8%	28.7%	29.0%	40.8%	28.6%

Moderate Impact: Properties Contributing 2% to <5% of Routine Maintenance Exhaust Emissions (N=13)

Property	% Emissions on All Properties				
	HC	NOx	CO	PM2.5	CO2
East Quogue Village Green	3.7%	3.6%	3.6%	3.9%	3.6%
Red Creek Park - All - see detail -54A not included (diesel)	3.4%	3.5%	3.5%	3.4%	3.5%
Town Hall	3.0%	2.9%	2.9%	3.1%	2.9%
Flanders Riverside Community Center, Nutrition Center	3.1%	3.0%	3.2%	3.1%	3.1%
Red Barn	3.0%	2.9%	2.9%	3.1%	2.9%
Town of Southampton Child Development Center	3.0%	2.9%	2.9%	3.1%	2.9%
Police Dept Headquarters	3.0%	2.9%	2.9%	3.1%	2.9%
John E Berwind Village Green & Historic Beebe Windmill	3.0%	2.9%	2.9%	3.1%	2.9%
Ludlam Ave Park	3.0%	2.9%	2.9%	3.1%	2.9%
Conscience Point Marina	2.6%	2.5%	2.5%	2.7%	2.5%
Trout Pond	3.0%	2.9%	2.9%	3.1%	2.9%
Foster Ave Park	2.6%	2.5%	2.5%	2.7%	2.5%
Big Duck Ranch	3.0%	2.9%	2.9%	3.1%	2.9%
Totals	39.2%	38.0%	38.1%	40.6%	38.1%

Appendix C. Percent of Noise at High and Moderate Impact Properties

High Impact: Properties Contributing 5% or More of Noise from Routine Maintenance (N=4)

Property	Routine Maintenance Noise
Good Ground Park	12.4%
North Sea Community Park	9.0%
Hampton West Park	7.2%
Southampton Meadows Park	5.4%
Totals	34.0%

Moderate Impact: Properties Contributing 2% to <5% of Noise from Routine Maintenance (N=12)

Property	Routine Maintenance Noise
East Quogue Village Green	3.7%
Flanders Riverside Community Center, Nutrition Center	3.6%
Police Dept Headquarters	3.5%
Red Barn	3.0%
Town Hall	3.0%
Town of Southampton Child Development Center	3.0%
Big Duck Ranch	3.0%
John E Berwind Village Green & Historic Beebe Windmill	3.0%
Ludlam Ave Park	3.0%
Trout Pond	3.0%
Conscience Point Marina	3.0%
Foster Ave Park	2.6%
Totals	37.4%

High Impact: Properties Contributing 5% or More of Noise from Spring/Fall Clean-Ups (N=6)

Property	Spring/Fall Clean-Up Noise
Good Ground Park	12.7%
East Quogue Village Green	11.1%
Town Hall	9.1%
Flanders Riverside Community Center	5.5%
Animal Control Building	5.5%
Bridgehampton Community Center	5.5%
Totals	49.4%