Alternative Fuels
Technical Assistance Program

Kennett Square

Borough of Kennett Square, PA

ALTERNATIVE FUELS, VEHICLES & TECHNOLOGIES FEASIBILITY REPORT

Prepared by Eastern Pennsylvania Alliance for Clean Transportation (EP-ACT)
With Technical Support provided by: Clean Fuels Ohio (CFO); & Pittsburgh Region Clean Cities (PRCC)

Contents

Analysis Background:

The Borough of Kennett Square is a small community located approximately 40 miles south-west of Philadelphia. The town size is 1.2 square miles with a population of under 800 residents. The borough's fleet consists of 26 vehicles of different types to support every day operations within the municipality. The fleet profile includes vehicles from the police department; codes department and public works department. Due to the relatively small footprint of the borough, the fuel usage and miles traveled are comparatively smaller than typical municipalities in Pennsylvania.

Kennett Square Borough has applied to The Commonwealth of Pennsylvania's newly developed Alternative Fuels Technical Assistance Program (AFTA) run by the Department of Environmental Protection seeking other recommendations for their fleet. This report is a culmination of meetings, information gathering and analysis specific to Kennett Square Borough vehicles and fleet usage of those vehicles and best reflects recommended practices and technologies that will best help Kennett Square Borough achieve their desired objectives.

1.0: Introduction – Fleet Feasibility Analysis:

This Alternative Fuel Vehicle (AFV) Fleet Performance Feasibility Study is designed to examine the feasibility and cost-savings potentials of deploying a range of commercially available alternative fuel, advanced vehicle, and efficiency solutions in the Kennett Square fleet. As with many municipalities, the Kennett Square fleet performs a range of essential activities including Police department's, code enforcement and public works operations. Providing these services account for large and ever-growing expenses for municipal budgets, and many of these expenses come in the form of vehicle acquisition prices, fuel purchases, and equipment maintenance costs. However, a range of advanced vehicles, alternative fuels, and efficiency technologies are currently available and have the potential to significantly reduce both annual and lifecycle fleet operational costs when deployed in the right applications.

2.0: Fleet Management Goals – Scope of Work & Criteria for Analysis:

Eastern Pennsylvania Alliance for Clean Transportation (EP-ACT), Pittsburgh Region Clean Cities (PRCC) and Clean Fuels Ohio (CFO) are pleased to present the following detailed AFV Options and Feasibility report. This report is designed to provide the following core deliverables: 1) Detail the priority criteria and goals for the fleet in evaluating technologies; 2) Provide a baseline analysis of current fleet operations with Key Performance Indicators (KPIs) on the fleets vehicles and operations; 3) Outline alternative fuel vehicle and efficiency technology options relevant to fleet operations; 4) Assess the operating costs and other investments needed to implement the various technology options; and 5) Provide Return on Investment (ROI) scenarios and recommendations based on the analyses above. We would like to thank Kennett Square for their assistance in gathering data and providing feedback for this report.

Our team has met with Kennett Square and have discussed their fleet and operation of it. They have outlined a set of broad goals and criteria for evaluating new technologies for fleet operations. These criteria are outlined in the table below and used throughout this report to evaluate various technology options for the Kennett Square fleet.

Priority Review Criteria for Analysis:
1. *Use life cycle cost effectiveness and return on investment projections as the primary tool for evaluating each potential fuel, vehicle technology, and station option.*
2. *Include data on environmental performance; factor into decision matrix as a secondary evaluation tool.*

We have used these criteria to evaluate alternative fuel and efficiency technologies that are most relevant and effective for the fleet's operations. In addition to these criteria, our staff have used the real-world fleet data provided by the Kennett Square to create key current vehicle performance profiles. Our staff utilizes these profiles to create alternative fuel vehicle replacement scenarios, charting out similar models of alternative fuel vehicles (including cost differences, mpg differences, maintenance cost differences, etc.).

The core work in this report focuses on comparing the operational costs and return on investment between the current fleet's vehicle performance and usage profiles and various alternative fuel replacement vehicle scenarios. Finally, we have looked at the Total Cost of Ownership (TCO) and Return on Investment (ROI) based on three fuel price models (a low oil model, status quo or "median" oil model, and a high oil price model). These models come from the U.S. Energy Information Administration (EIA), which collects, analyzes, and disseminates independent and impartial energy information to promote sound policymaking, efficient markets, and public understanding of energy's interaction with the economy and environment. A summary of the current performance of the fleet is detailed on the following page.

3.0: Key Performance Indicators – Existing Fleet Analysis

We generally recommend replacing vehicles at appropriate intervals to minimize fleet repair costs and maximize performance and efficiency. Our staff collected data including fleet vehicle inventory data, fuel cost and consumption data, and replacement plan data. Based on the provided information, as well as planned replacement intentions, target vehicle types were prioritized and considered for analysis. Kennett Square has indicated short-term plans to replace passenger car type vehicles with hybrid/EV alternatives. They have also indicated long-term intentions to replace heavy duty, refuse type vehicles, while considering feasible alternative fuels. The following tables are meant to summarize the information provided by Kennett Square.

Borough of Kennett Square Fleet Breakdown - 26 Units			
Vehicle Application	**Units**	**Fleet %**	**Fuel Consumption (gal)**
Heavy Duty	7	26.92%	2,966
Light Duty	5	19.23%	5,405
Medium Duty	1	3.85%	562
Off Road	1	3.85%	297
Sedan	10	38.46%	9,430
SUV	2	7.69%	3,905

4.0: Alternative Fuel Options – Summary Comparisons & Conclusions:

This report is designed to provide a full range alternative fuel and vehicle options analysis for Kennett Square fleet operations. This section is designed to provide basic foundational information for a comparison of five commercially available alternative fuel types: Biodiesel (B20), Ethanol (E85), Compressed Natural Gas (CNG), Propane (LPG), and Electric vehicles (EV). The following sections of this report will provide a more detailed explanation and analysis of recommended fuel types, as well as chart out prospective vehicle and capital cost return on investment scenarios based on each fleet partner's real-world vehicle and usage data. The following table is designed to provide a high-level summary of each fuel option:

High Level Alternative Fuel Comparisons					
	Biodiesel (B20)	**Ethanol (E85)**	**CNG**	**Propane**	**EV**
Basics	Biodiesel is a renewable fuel that can be manufactured from organic oils, fats, or recycled grease for use in diesel vehicles.	Ethanol is a widely used renewable fuel made from corn and other plant materials. It is blended with gasoline.	Natural gas is a domestically abundant gaseous fuel that can have significant fuel cost savings over gasoline and diesel fuel.	Propane is a readily available gaseous fuel that has been widely used in vehicles throughout the world for decades.	Electricity can be used to power plug-in electric vehicles, which are increasingly available. Hybrids use electricity to boost efficiency.
Retail Availability	Widely available	Widely available	Purchased through utility pipeline.	Regional / Local distributors.	Widely available but charger required
Retail Cost	Moderate	Moderate	Low	Moderate to low.	Low if charger is available
Pollution-Tailpipe	Low, except for CO2	Low, except for CO2	Low—25 percent lower CO2 than diesel and gas.	Moderate	None
Major Pros	Universal availability and moderate cost. Environmental benefit	Universal availability and moderate cost savings.	Low fuel cost. Low Emissions & Noise. Extensive distribution.	Simpler station than CNG. Fuel savings vs. gasoline likely in fleets.	Limited range and not well suited to heavy vehicles because of range and battery weight.
Major Cons	No major cost savings. Cold flow issues if not properly treated	Lower energy per gallon. Limited environmental benefit	High cost / complexity of stations.	Seasonal price spikes if not under contract. No heavy vehicle options.	A charge takes hours and applications are limited based on vehicle drive cycle.
Conclusion	Use **biodiesel** only when fuel cost is same or lower than diesel fuel.	Do not use **ethanol** until it's 20-27% lower $ than gasoline.	**CNG** vehicles are cost-effective when threshold parameters are met, but public fueling & maintenance partner must be identified for ROI	**Propane** vehicles are the most cost-effective consideration for select vehicles, especially when factoring in available incentives.	**EVs** are cost-effective and feasible; however the segments of the fleet with the most significant ROI were Police.

The conclusions on the previous chart are based on detailed analysis of current vehicle operational profiles, alternative fuel replacement scenarios (including vehicle cost and performance data vs. conventional), refueling infrastructure investments needed, and any other required costs (i.e. maintenance facilities modifications). This does not include an analysis of environmental advantages for using any type of alternative fuels.

4.1: Detailed Options Analysis:

The core work in this report focuses on comparing vehicle acquisition costs (conventional model vs. alternative fuel model) and the operational costs (specifically savings from lower cost alternative fuels, and savings from lower maintenance costs on alternative fuels vs. conventional fuels). Using information on the "incremental cost premium" to acquire an alternative fuel model and the "operational savings" of running alternative fuels, this report then examines the return on investment (ROI) scenarios between the current fleet's vehicle performance profiles and various alternative fuel replacement vehicle scenarios. Finally, we have looked at the Total Cost of Ownership (TOC) and Return on Investment (ROI) based on three fuel price models (a low oil price model, status quo or "median" reference oil price model, and a high oil price model). These models come from the U.S. Energy Information Administration (EIA).

The following table is designed to summarize the various vehicles that meet a "break even" or have a "Return on Investment (ROI)" when examining fleet specific vehicle types, incremental cost premiums to acquire similar alternative fuel models, relevant fleet usage (miles and fuel use) vs alternative fuel MPG for similar deployments, and any notable maintenance cost savings from alternative fuel vehicle maintenance. The following table details the number of vehicles in each category that have a return on investment given the US EIA's 10 year "Median Fuel Price" projections through 2027 (detailed above).

Vehicles Meeting Positive ROI with Alternative Fuel Options

Vehicles with PROPANE Alternative Options

Vehicle Type	Gas			Diesel		
	Units	Avg. Fuel	Miles	Units	Avg. Fuel	Miles
Heavy Duty	0	-	-	0	-	-
Light Duty	0	-	-	2	1,439	13,081
Medium Duty	0	-	-	0	-	-
Sedan	4	1,705	15,496	0	-	-
SUV	2	1,953	17,750	0	-	-

Vehicles with CNG Alternative Options

Vehicle Type	Gas			Diesel		
	Units	Avg. Fuel	Miles	Units	Avg. Fuel	Miles
Heavy Duty	0	-	-	0	-	-
Light Duty	0	-	-	2	1,439	13,081
Medium Duty	0	-	-	0	-	-
Sedan	5	1,439	9,685	0	-	-
SUV	2	1,953	17,750	0	-	-

Vehicles with Electric Alternative Options

Vehicle Type	Gas			Diesel		
	Units	Avg. Fuel	Miles	Units	Avg. Fuel	Miles
Heavy Duty	0	-	-	0	-	-
Light Duty	0	-	-	0	-	-
Medium Duty	0	-	-	0	-	-
Sedan	6	1,336	12,149	0	-	-
SUV	0	-	-	0	-	-

The table above is based on Kennett Square's provided vehicle profile. The table identifies the vehicle types that show a positive ROI utilizing the US EIA's median fuel price scenario. 9 vehicles had a positive ROI on CNG. Due to the high costs for CNG station construction, as well as requirements to update garage facilities where any CNG vehicle will be maintained or stored, CNG vehicles will only provide Kennett Square a positive ROI if a public CNG fueling station can be identified. Currently the closest public CNG refueling station is 10 miles away, in Coatesville PA, and this would be uneconomical. Electric Vehicles (EV's) work in one segment of Kennett Square's fleet, which is the police department, unfortunately due to the nature of use of police vehicles, including, instantaneous need for fuel, EV's do not work in this fleet segment.

The fueling option that makes financial sense is propane. The following sections will explain potential and current scenario's utilizing propane as a vehicle fuel.

4.2: Detailed Propane Autogas Options Analysis:

Propane is produced as a by-product of natural gas processing and crude oil refining. It accounts for about 2% of the energy used in the United States. The interest in propane as an alternative transportation fuel stems mainly from its domestic availability, high energy density, and clean-burning qualities. Propane is the world's third most common engine fuel and is considered an alternative fuel under the Energy Policy Act of 1992. Older propane vehicle models injected the fuel as gas vapor for combustion. However, modern propane vehicles now almost entirely operate with Liquid Propane Injection engine systems and offer higher fuel efficiency, performance, and reliability compared to older propane vehicles. Additional information about propane also can be found here: https://www.afdc.energy.gov/uploads/publication/propane_basics.pdf

Propane Overview: Properties, Characteristics, and Considerations	
	Propane Autogas (LPG)
Basic Properties	Gas (C3H8), stored at low pressure (~120 psi) as color and odorless liquid.
Source/Production	Domestic: By-product of conventional oil & gas exploration; non-renewable.
Distribution	Rail and Truck trailer distribution
Availability	Delivered to station storage tanks
Retail Unit	Gasoline or Diesel gallon energy (BTU) equivalent
Fuel Retail Cost	**Regional Avg: ~$1.47 - $1.80 gge** *(*Higher volume contracts result in lower prices)*
Vehicle Cost	Lower cost; ~$5,000-$10,000 per vehicle
Station Costs	Low cost, similar set up to gasoline except with above ground tanks, limited permitting, and environmental concerns.
Facility Modifications	No major facilities modifications; heavier than air fuel similar properties to gasoline and diesel
Engine Noise Level	Low noise level, ~1/10 decibel level
Environmental	No threat to soil, surface water, or groundwater, dissipates in air
Tailpipe Emission	Lower than conventional gas and diesel vehicles

Propane also offers significant emissions benefits as detailed below.

Propane Emissions vs. Typical Diesel Baseline Emissions*					
	PM	**NO_x**	**CO**	**HC**	**$C0_2E$/ GHG**
Propane (new vehicle)	100%	> 60%	>90%	>80%	19%
Propane (conversion)	80%	0%	20-40%	- 10%	21-24%
** These figures, and new studies on which the figures are based, are posted at the U.S. Department of Energy's Alternative Fuels Data Center at http://www.afdc.energy.gov/afdc.*					

Kennett Square currently operates vehicles that have immediate opportunities to be converted to or replaced with propane powered technologies as detailed above. With the incremental cost of light-medium duty propane vehicles ranging from $5,000-$12,000, propane vehicles deployed in many fleet operations will easily result in a net lifetime savings if fuel usage meets basic minimum thresholds. Though propane fueling stations are an additional required investment, the total capital costs for a propane station is relatively low for a station needed for Kennett Square would be approximately $15,000 - $20,000, and these costs can be amortized into the per gallon fuel price.

The following table provides real world cost details for a medium volume capacity (up to ~8,000 gallons per year as an average budgetary quoted price from local propane suppliers.). The information in the table includes three cost categories (design, equipment, and construction). Though final costs for individual entities will vary, this information is relevant to the size and capacity of a station for your fleet operations. Since propane is delivered by truck, the station capacity is scalable and can be increased at no cost by scheduling more frequent fuel drops as needed or as the number of vehicles increase.

Propane Station Estimate (Station Capacity: 20,000 GGE/Year)	
Total Design Costs	**$500**
Total Equipment Costs (500 gal tank + 1 dispenser)	**$15,000**
Total Construction Costs	**$3,000**
Total Propane Station Costs:	**$18,500**

Again, costs for an equivalent station located at your specific location will vary. Cost will vary based on factors such as how much site preparations are needed, i.e. permits, concrete padding, electrical, etc. as well as specific design and construction costs. Though these costs can be directly incurred by the fleet, propane fuel suppliers are also willing to enter into agreements to front the capital investment for such infrastructure in exchange for a long-term fuel contract with a fleet. In these cases, fuel suppliers amortize the cost of the station into the long-term contract price for the fuel. In a basic demonstration of this, in the case of Kennett Square, a local supplier who installs, maintains and owns the propane dispensing system, will charge an extra fifteen cents per gallon over the market price for a minimum 3-year contract. What that would approximately equate to for Kennett Square would be $ 1.91 per gallon (including taxes). Longer contracts can be secured, and the rate of the fuel cost would decrease, but Kennett Square, would be bound to a longer contract term.

The upcoming information provides insight into alternative fuel vehicle comparisons related to fuel consumption and maintenance costs. Operation and maintenance costs are derived from average miles per vehicle type, assuming costs per mile found in the referenced. Total costs are calculated by adding operation and maintenance costs with the product of average annual gallons consumed and specific, projected fuel prices for each year, 2018

through 2027. The following table helps visualize the overall difference in fuel costs by providing the ten-year average price for each fuel type in three different projected scenarios:

10 Year Average of Fuel Prices									
	Low Oil Price			Median Oil Price			High Oil Price		
	Gas	Propane	Diesel	Gas	Propane	Diesel	Gas	Propane	Diesel
10 Year Average*	$1.69	$1.31	$1.89	$2.63	$1.58	$3.13	$4.56	$2.20	$5.40
Maintenance Costs/Mile**	$0.03	$0.015	$0.03	$0.03	$0.015	$0.03	$0.03	$0.015	$0.03

* There is an individual price applied to each fuel type, which can be seen more completely in the supplied appendix. Per gallon price
**A 50% reduction in maintenance costs by running a vehicle on propane, compared to gasoline, is a factor the Texas Railroad Commission uses in their calculations when considering an alternative fuel conversion study. https://www.roushcleantech.com/saving-calculator/

The following 3 tables demonstrate the lifetime cost savings or propane vehicles vs. conventional fuels, using US EIA price data. *Propane has a lower energy per volumetric unit than gasoline and diesel fuel. Therefore, the assumed fuel consumption amount is higher for the propane vehicle, which equals the energy content in one gasoline gallon.

Diesel vs. Propane- Light Duty Truck

Diesel/Propane Vehicle Comparisons: LD Truck			
Current Vehicle		Propane Replacement	
Base Cost	$30,945	Incremental Cost	$3,805
Avg. Fuel/Year	1,439	Avg. Fuel/Year	2,218
Annual Mileage	13,081	Annual Mileage	13,081
Maintenance Costs/Mile	$0.03	Maintenance Costs/Mile	$0.015

Diesel vs. Propane Operating Costs: LD Truck						
	Low Oil Price		Median Oil Price		High Oil Price	
	Diesel $1.89/ gal	Propane $1.31/ gal	Diesel $3.13/ gal	Propane $1.58/ gal	Diesel $5.40/ gal	Propane $2.20/ gal
O&M	$3,924	$1,962	$3,924	$1,962	$3,924	$1,962
Total	$31,184	$31,011	$48,961	$36,989	$81,649	$50,853
Net Savings	$3,632		$8,167		$26,991	

Gasoline vs. Propane - Sedans

Gas/Propane Vehicle Comparisons: Sedan			
Current Vehicle		**Propane Replacement**	
Base Cost	$20,000	**Incremental Cost**	$7,500
Avg. Fuel/Year	1,705	**Avg. Fuel/Year**	2,356
Annual Mileage	15,496	Annual Mileage	15,496
Maintenance Costs/Mile	$0.03	Maintenance Costs/Mile	$0.015

Gas vs. Propane Operating Costs: Sedan						
	Low Oil Price		**Median Oil Price**		**High Oil Price**	
	Gas $1.69/ gal	**Propane** $1.31/ gal	**Gas** $2.63/ gal	**Propane** $1.58/ gal	**Gas** $4.56/ gal	**Propane** $2.20/ gal
O&M	$4,649	$2,324	$4,649	$2,324	$4,649	$2,324
Total	$33,474	$33,186	$49,556	$39,537	$82,357	$54,266
Net Savings	**$7,212**		**$2,519**		**$20,591**	

Gasoline vs. Propane- SUV

Gas/Propane Vehicle Comparisons: SUV			
Current Vehicle		**Propane Replacement**	
Base Cost	$25,000	**Incremental Cost**	$10,500
Avg. Fuel/Year	1,953	**Avg. Fuel/Year**	2,699
Annual Mileage	17,750	Annual Mileage	17,750
Maintenance Costs/Mile	$0.03	Maintenance Costs/Mile	$0.015

Gas vs. Propane Operating Costs: SUV						
	Low Oil Price		**Median Oil Price**		**High Oil Price**	
	Gas $1.69/ gal	**Propane** $1.31/ gal	**Gas** $2.63/ gal	**Propane** $1.58/ gal	**Gas** $4.56/ gal	**Propane** $2.20/ gal
O&M	$5,325	$2,663	$5,325	$2,663	$5,325	$2,663
Total	$38,343	$38,013	$56,764	$45,288	$94,336	$62,160
Net Savings	**$10,170**		**$976**		**$21,677**	

As described in the previous tables, this analysis has examined three fleet vehicle types: LD Truck, Sedan, and SUV. While propane does not require maintenance facility modifications or costly training for mechanics, it would require the fleet to install a propane autogas refueling station at a relevant depot location. The highest expected cost for such a station is $15,000 – $20,000 but the fleet would likely realize a station for significantly lower costs based on partnering and contracting with a local propane supplier.

The table below is designed to detail the total investment including: vehicle cost; station cost and maintenance cost. –This table calculates the total cost or net savings based on utilizing these vehicles for 10 years at EIA projected fuel prices.

10 Year Total Investment ROI Scenarios			
	Low Oil Price	Median Oil Price	High Oil Price
LD Truck (2)	$7,264	$16,334	$53,982
Sedan (3)	$21,636	$7,557	$61,773
SUV (2)	$20,340	$1,952	$43,354
Station Cost	($18,500)	($18,500)	($18,500)
Ten Year ROI	$67,740	$7,343	$140,609

The previous tables and following below detail conservative scenarios (erring on the high-cost side) of vehicle incremental price, and infrastructure costs. Prices for fuel are based on best estimates over 10 years from the US Energy Information Administration. Based on this, we offer the following recommendations:

4.2 Maximize Incentives – Pursue Federal, State, and Local Subsidies:

Securing funding is often critical to the success of efforts to reduce petroleum use and vehicle emissions in fleet operations. The Pennsylvania Department of Environmental Protection (DEP) has and will continue to offer grant funding for clean, alternative fuel projects in Pennsylvania and investment in Pennsylvania's energy sector through the **A**lternative **F**uels **I**ncentive **G**rant Program (AFIG). The AFIG program is designed to reimburse up to 50% of the incremental cost to purchase alternative fuel fleet vehicles or convert vehicles to utilize alternative fuels up to a maximum of $20,000 for each vehicle and $300,000 per application. Station Cost can be applied for in a separate application provided you have 10 or more eligible vehicles in your fleet that would utilize the station. Our analysis did not identify the threshold of 10 vehicles for immediate or near-term conversion or replacement with propane, so it is unlikely that Kennett Square can apply for AFIG funds to help offset the cost of the station at this time. The Pennsylvania DEP has opened the Alternative Fuels Incentive Grant (AFIG) program, details of the program and the RFP can be found at: http://www.dep.pa.gov/citizens/grantsloansrebates/alternative-fuels-incentive-grant/pages/default.aspx

There are opportunities with the AFIG program to save 50% on incremental costs of alternative fuel replacement vehicles. With that cost reduction, more savings opportunities present themselves, and projections change accordingly. The following table is designed to detail projected numbers assuming replacement of all vehicles from each category:

10 Year Total Investment ROI Scenarios (w/AFIG Incentives)				
Vehicle Types	**AFIG $/Vehicle**	**Low Oil Price**	**Median Oil Price**	**High Oil Price**
LD Truck (2)	$1,902	$ 3,459	$ 20,139	$ 57,787
Sedan (3)	$3,750	$ 10,386	$ 18,807	$ 73,023
SUV (2)	$3,750	$ 12,840	$ 9,452	$ 50,854
Station Cost (<10 units)	n/a	($18,500)	($18,500)	($18,500)
Ten Year ROI	-	$45,185	$29,898	$163,164

The table below represents the ROI if Kennett Square used a propane supplier to build and supply the infrastructure for a propane fueling station, contracting fuel for an additional $0.15/gal:

10 Year Total Investment ROI Scenarios using Propane Supplier Station				
Vehicle Types	**AFIG $/Vehicle**	**Low Oil Price**	**Median Oil Price**	**High Oil Price**
LD Truck (2)	$1,902	$ 10,114	$ 13,486	$ 51,134
Sedan (3)	$3,750	$ 20,991	$ 8,202	$ 62,418
SUV (2)	$5,250	$ 17,938	$ 4,354	$ 45,756
Ten Year ROI	-	$49,043	$26,042	$159,308

5.0: Key Recommended Actions – Conclusion

The following recommendations for further action are based on our review and assessment of data supplied and current fleet Key Performance Indicators. These summary recommended actions are designed to provide a framework for achieving fleet goals. The Table below summarizes each of the overall recommendations in this report, based on a detailed analysis leading to the specific recommended action.

Key Recommended Actions:
Fuel Options Assessment:
1. **Deploy propane vehicle replacements and/or conversion for LD Trucks, Sedans, and SUVs with an ROI as noted in the table below.**
2. Pursue state and federal incentives, subsidies, grant programs, and other incentives to help reduce the implementation costs of strategies and technologies outlined in this report.
3. Pursue a local propane supplier who will build and maintain a fueling station for your vehicles.

More information describing the methodology and full analysis results for each of the alternative fuel options scenarios is available upon request. This report has researched many possible scenarios based on the current fleet profile, as Kennett Square shifts its fleet structure to utilizing different types of vehicles and other scenarios not examined here, the recommendations made herein might change as well.

An in-depth analysis has been performed on the Kennett Square fleet. Although many fuels including CNG and Electric Vehicles (EV's) worked in some KPI scenario's, the cost associated with conversions and the departments in which some of the vehicles are used would not be practical for those alternative fuel types. We have determined based on this analysis that the following vehicles are good candidates for propane replacements.

Suggested Vehicle Replacements/ Conversions						
Make	**Model**	**Replace/Convert**	**Year**	**Fuel Type**	**Mileage**	**Type of Use**
****Ford**	Crown Vic	Replace	2004	Gas	115,785	Inspections
GMC	Pickup	Replace	2005	Diesel	98,531	Maintenance
Dodge	Charger	Replace	2010	Gas	95,000	Police
Chevrolet	Caprice	Replace	2013	Gas	65,000	Police
Chevrolet	Caprice	Replace	2014	Gas	50,000	Police
Dodge	Pickup	Convert	2015	Diesel	35,901	Other
Ford	Explorer	Convert	2015	Gas	35,000	Police
Ford	Explorer	Convert	2016	Gas	18,000	Police
** This vehicle does not meet the ROI under the current analysis, due to the age and mileage, we suggest replacement to add additional benefits to the overall positive ROI while replacing the other vehicles						

**Appendix A - shows actual pricing scenarios that were used in the calculations for ROI.