# Executive Summary: Draft PA No. 15 – Fleet Fuel Reduction Program

### Description

A fleet fuel reduction program would change the composition of SCWD and SqCWD vehicle fleets, use alternative fuels, and implement other fuel savings strategies, such as behavioral changes, to reduce the GHG emissions of the fleets.

### Amount of GHG Reduction

SCWD's 53-vehicle fleet uses approximately 27,000 gallons per year of fuel, and SqCWD's 30-vehicle fleet uses approximately 9,200 gallons per year of fuel. It is estimated that SCWD could offset approximately 41 MT $CO_2e$ per year by purchasing alternative vehicles, utilizing B-20 biodiesel fuel, and implementing driver behavioral changes. By implementing similar changes, SqCWD could offset approximately 14 MT $CO_2e$ per year. This project could reduce approximately 6 to 10% of the potential GHG reduction goals for SCWD, and 1% of the potential GHG reduction goals for SqCWD.

### Project Life and Sustainability

Without the **scwd²** Desalination Program, it is assumed that SCWD and SqCWD would replace their fleet vehicles with alternative vehicles at a rate of 5% per year for 20 years. The accelerated portion of this program assumes a replacement rate of 20% per year for 5 years, so the program can only claim the difference between the two. This program would have decreasing GHG offsets over time and would expire after 20 years.

### Project Cost

Table ES-1 summarizes the estimated project costs.

**Table ES-1: Fleet Fuel Project Summary**

| Agency | Life (yr) | Annual GHG Reductions (MT/Yr) | Capital Cost ($) | Average Annual Net Cost ($/Yr) | Lifecycle GHG Reduction Cost ($/MT) |
|---|---|---|---|---|---|
| SCWD | 20 | 41 | $5.4 million | $403,000 | $7,700 |
| SqCWD | 20 | 14 | $3.5 million | $290,000 | $16,000 |

# Draft Project Assessment No. 15 – Fleet Fuel Reduction Program

## Description

This project assessment considers GHG reduction opportunities from potential changes in the composition of the SCWD and SqCWD vehicle fleets, the use of alternative fuels, and other fuel savings strategies. SCWD's 53-vehicle fleet currently uses approximately 27,000 gallons per year of fuel, and SqCWD's 30-vehicle fleet uses approximately 9,200 gallons per year of fuel.

This assessment looks at the GHG emissions associated with the lifecycle of different transportation fuels, or "well-to-wheel" emissions, which includes both the direct GHG emissions associated with the combustion of transportation fuels for vehicle operation ("tank-to-wheel" emissions), as well as the indirect GHG emissions associated with the production and distribution of these transportation fuels ("well-to-tank" emissions). This approach allows for like comparisons of the GHG consequences among various alternative vehicle and fuel technologies.

**Baseline Elements**

*Low Carbon Fuel Standard (LCFS):* The California Air Resource Board (CARB) has adopted a Low Carbon Fuel Standard (LCFS) that requires transportation fuel providers to reduce the well-to-tank carbon intensity of both gasoline and diesel by 10% by 2020. This assessment includes LCFS as part of the baseline, since **scwd²** will have to meet this standard regardless of the project.

*Alternative Vehicle Procurement:* Transitioning SCWD and SqCWD's current fleets of vehicles to cleaner fuels and more efficient vehicles could provide significant well-to-wheel GHG reductions. This assessment assumes that within each vehicle class, SCWD/SqCWD would gradually increase the number of vehicle miles traveled by alternative vehicle types, while decreasing the vehicle miles traveled by baseline vehicle types. The baseline rate of transition is assumed to occur evenly over a 20-year period—that is, each year 5% of baseline vehicle miles will be replaced with alternative vehicle miles. When a vehicle class has more than one alternative vehicle substitute, it is assumed that the alternative vehicle miles are split equally among those substitutes.

The table below shows how baseline vehicle type GHG intensity per mile travelled (well-to-wheel grams $CO_2$e/mile) compares to the alternative vehicle substitutes evaluated in this assessment.

**Table 1: 20-year Average Well-to-Wheel Carbon Intensity of Conventional and Alternative Vehicles by Vehicle Class**

| Conventional Vehicle | Well-to-Wheel grams $CO_2$e/mile | Alternative Vehicle | Well-to-Wheel grams $CO_2$e/mile |
|---|---|---|---|
| **Class 1**<br>Gasoline Light Trucks<br>(e.g. Ford Ranger) | 835 | Electric Vehicle | 143 |
| **Class 1 & Class 2a**<br>Gasoline Light and Light-duty Truck<br>(e.g. Dodge Ram 1500) | 888 | Diesel | 349 (ULSD)<br>338 (B-20) |
| | | Gasoline Hybrid Electric | 292 |
| | | Compressed Natural Gas | 295 |
| **Class 2b**<br>Gasoline Commercial Light Truck<br>(e.g. Dodge Ram 2500) | 1,266 (Gasoline)<br>966 (Diesel) | Diesel | 555 (ULSD)<br>539 (B-20) |
| | | Hybrid Electric | 464 |
| | | Compressed Natural Gas | 470 |
| **Classes 3-5**<br>Diesel and Gasoline Light-Heavy Truck<br>(e.g. Chevrolet Silverado) | 1,263 (Gasoline)<br>1,317 (ULSD)<br>1,191 (B-20) | Liquid Natural Gas | 998 |
| | | Diesel Hybrid Electric | 1,020 (ULSD)<br>991 (B-20) |
| **Classes 6-8**<br>Diesel Heavy-Heavy Truck<br>(e.g. F 750 Dump) | 2.128 (ULSD)<br>1,924 (B-20) | Liquid Natural Gas | 1,289 |
| | | Diesel Hybrid Electric | 1,156 (ULSD)<br>1,122 (B-20) |



- *Electric Vehicles:* Electric vehicles (EVs) are propelled by electric motors powered by rechargeable batteries. EVs can be recharged on conventional electrical circuits in about eight hours or in as little as 15 minutes with a higher rated electrical service. EVs already exist in the marketplace, including the Nissan Leaf. Other passenger substitutes to gasoline light truck vehicles include hybrid electric vehicles, like the Toyota Prius, or plug-in hybrid electric vehicles, like the Chevrolet Volt.

  While electric vehicles (EVs) emit no direct tailpipe GHG emissions, there are indirect emissions associated with the generation of electric power that charges the batteries. While the difference between EV emissions and the emissions from other Class 1-2a alternative vehicle options (diesel, gasoline hybrid electric and compressed natural gas) are not huge, there is still value to the larger community, through demonstration, in early adoption of this emerging technology.

  In addition, SCWD/SqCWD could consider the actual use of its Class 1 and Class 2a light trucks to confirm their use for hauling. In this analysis, we assumed that all trucks were necessary for hauling capacity. However, if there are any trucks that are used for passenger transport, SCWD/SqCWD could transition to electric passenger vehicles, which have even lower wheel to well emissions, and potential for further GHG reductions, than the options we evaluated.

- *Light Duty and Commercial Light Trucks:* For gasoline powered Class 1 light trucks (LTs), Class 2a light-duty trucks (LDTs) and Class 2b commercial light trucks (CLTs), the assessment assumes that the current vehicles are gradually replaced by a combination of clean diesel, gasoline hybrid electric, and compressed natural gas (CNG) powered trucks.

  Hybrid electric LDTs, like the Chevrolet Silverado Hybrid, already exist in the marketplace. While new CARB-compliant clean diesel LDTs are not currently available in the U.S., each U.S. automaker has developed a market ready half-ton diesel pickup prototype, expected to be brought to market as the economy strengthens. While LDTs must be retrofitted with after-market conversion kits to be powered by CNG, they are available for a wide range of LDT makes and models and fully converted models are available direct from many dealerships.

As a result of recent improvements in diesel engine technology, CARB-compliant clean diesel CLTs are currently available in the marketplace including the Chevrolet Silverado 2500/3500. No hybrid electric CLTs are currently available in the U.S., however as state and federal fuel economy rules are extended to this vehicle class, more market choices should become available. Like LDTs, CNG powered CLTs must be retrofitted but are readily available through many dealerships.

- *Light-Heavy and Heavy-Heavy Trucks:* The assessment assumes that heavier gasoline and diesel trucks in Classes 3 through 7 are gradually replaced with liquid natural gas (LNG) and diesel hybrid electric powered vehicles.

  At least 20 models of hybrid electric light-heavy and heavy-heavy trucks are currently available in the market in a range of chassis types, such as box vans, utility trucks, and long-haul tractors. Hybrid electric utility trucks hold particular promise for significant GHG reductions since auxiliary equipment, like vacuums and pumps, can operate solely on the truck's battery. LNG powered light-heavy and heavy-heavy trucks are available both as after-market conversions as well as factory built options.

**Accelerated or Additional Program Elements**

*Accelerated Alternative Vehicle Procurement:* An accelerated program would replace SCWD and SqCWD's current fleets of vehicles at a rate of 20% over 5 years. The difference between the baseline rate and the accelerated rate would be accounted for in GHG reduction.

It should be noted that this assessment does not consider operational constraints (e.g. towing capacity) that must be considered when selecting a particular vehicle make and model. However, while certain alternatives may not be suitable for SCWD/SqCWD's specific application, in general, the technologies underlying the alternatives have the potential to exceed the power and torque performance of conventional vehicles.

It is estimated that implementing this strategy could reduce SCWD/SqCWD well-to-wheel fleet emissions by approximately 670 MT $CO_2e$ over a 20-year period.

*Biodiesel (B-20):* Switching from diesel fuel to B-20 fuel (20% biodiesel, 80% diesel) could reduce SCWD/SqCWD's well-to-wheel fleet GHG emissions by approximately 63 MT $CO_2e$ over a 20-year period. The benefit is not significant, since conventional, soybean-based biodiesel still has relatively large well-to-tank GHG emissions. If the biodiesel used in the blending were derived from alternative feedstock, such as used cooking oil, the GHG reductions could be significantly greater.

*Behavioral Changes:* Implementing educational programs that encourage drivers to operate fleet vehicles more efficiently and deploying technologies, such as telematics, that enable fleet mangers to optimize vehicle dispatching or monitor vehicle operation can yield considerable GHG emission reductions.

In this assessment, it is assumed that a behavioral change policy would consist of driver behavioral changes, including no-idle policy and avoiding rapid acceleration/deceleration, as well as keeping tire properly inflated and vehicles maintained, but does not include telematics. This is estimated to sustain an average fuel economy improvement of 5% per year. Achieving this rate of fuel savings could reduce SCWD/SqCWD well-to-tank GHG emissions by approximately 304 MT $CO_2$e over a 20-year period.

**Vendors**
A number of organizations can provide technical assistance and financial support for implementing fleet fuel strategies, including:

- CALSTART (http://www.calstart.org/Homepage.aspx): Works with business, fleets, and government to develop and implement clean, efficient transportation solutions. CALSTART manages the California Hybrid Truck User Forum and the Natural Gas Vehicle Co-Op, and administers the California Hybrid Truck and Bus Voucher Incentive Project.

- Environmental Defense Fund Green Fleet Project (http://business.edf.org/projects/fleet-vehicles): Sponsor private sector partnerships to reduce fleet GHG emissions. Publishes Fuel-Smart Driver Training curriculum.

- California Natural Gas Vehicle Coalition (http://www.cngvc.org/): Association of natural gas vehicle manufacturers. Publishes *Natural Fueling Station Directory for California*.

## History and Technical Maturity

In recent years, municipal utilities and other public fleets have been increasingly adopting goals to reduce their GHG emissions. The water utility in the City of Austin, Texas has adopted a goal of reducing fleet GHG emissions by 20% by 2020. The Las Vegas Valley Water District has converted more than 80% of its 1,800-unit fleet to alterative-fueled vehicles, including bio-diesel, CNG and hybrid electric. SCWD has already implemented telematics on three vehicles.

Not all types of alternative vehicles, like clean diesel LDTs, are currently available in the marketplace. However, at least one market-ready substitute technology is currently available for each vehicle class.

## Reliability and Operational Complexity

One operational challenge of a fleet fuel consumption program is the existence of adequate fueling infrastructure. Currently, commercial refueling stations are limited, so successful implementation would require installing on-site fueling infrastructure at SqCWD facilities to accommodate natural gas or biodiesel refueling. Partnering with other public agency fleets may provide cost-saving opportunities. Another operational challenge is staff acceptance of behavioral driving changes.

## Sustainability

Without the **scwd$^2$** Desalination Program, it is assumed that SCWD and SqCWD would replace their fleet vehicles with alternative vehicles at a rate of 5% per year for 20 years. The accelerated portion of this program assumes a replacement rate of 20% per year for 5 years, so the program can only claim the different between the two. This program would have decreasing GHG offsets over time and would expire after 20 years.

## Local Considerations

### Economy and Education

In addition to the global benefits of GHG reductions, SCWD/SqCWD will benefit from this project through the direct and local reduction of GHGs and other vehicle tailpipe emissions. The transition to alternative vehicles recommended in this analysis provides a local GHG emissions reduction of approximately 1,040 MT $CO_2e$ over 20 years.

In addition, it is likely that a fleet fuel adjustment project would have a beneficial impact on local air quality, primarily through reductions in gasoline consumption, transitioning diesel consumption to clean diesel technologies, and increasing the use of cleaner burning natural gas.

### Environment

*Air*: This program would improve local air quality through reductions in PM and $NO_x$ emissions.

*Land*: EV charging stations would require a small amount of land.

*Water*: There is no anticipated water impact.

*Noise*: Since some alternative vehicles produce less noise than traditional vehicles, there could be reduced engine noise.

*Aesthetic/Visual*: There are no anticipated aesthetic or visual impacts.

*Waste by-product*: There is no anticipated waste by-product impact.

## GHG Project Eligibility Criteria Compliance

This section describes the six eligibility criteria that a fleet fuel adjustment project must meet in order to be considered a regulatory compliance GHG offset project.

*Additional:* This program would take credit for the additional, accelerated alternative vehicle procurement at a rate of 20% over 5 years, minus the baseline rate of 5% over 20 years. The purchase of B-20 versus ULSD also likely meets the implementation barrier test. These two strategies also likely meet the common practice test, since most utility fleets are still dominated by conventional vehicles and fuels.

*Quantifiable:* GHG reductions realized through the procurement of alternative fueled vehicles and the purchase of B-20 can be readily established using existing GHG inventory methodologies. In the end, the quantification of GHG reductions comes down comparing alternative fuel consumption to business as usual fuel consumption. This can be done by comparing the emissions from alternative fuels to the emissions associated with an equivalent amount of conventional fuel.

*Verifiable:* With adequate recordkeeping, GHG reductions realized through the procurement of alternative fueled vehicles and the purchase of B-20 could be readily verified by a third-party.

*Enforceable:* Only the tank-to-wheel portion of GHG reductions realized through the procurement of alternative fueled vehicles and the purchase of B-20 would meet the standard for enforceability.

*Real:* The difference in the carbon intensity of different fuels is clearly established in the scientific literature. Since the GHG reductions realized through the procurement of alternative fueled vehicles and the purchase of B-20 would be based on measured changes in the types of fuels combusted for transportation, there is high confidence that the emissions reduction would be real.

*Permanent:* There is no risk of reversibility, as the GHG reductions realized through the procurement of alternative fueled vehicles and the purchase of B-20 would be based on instantaneous fuel substitutions. Once a unit of alternative fuel is combusted, there is no chance that a unit of conventional fuel would combusted instead.

## Estimated GHG Reductions

The SCWD/SqCWD cumulative well-to-wheel GHG emissions total approximately 1,040 MT of $CO_2$ for the 20-year period. This project could reduce approximately 6 to 10% of the potential GHG reduction goals for SCWD, and 1% of the potential GHG reduction goals for SqCWD. Table 2 shows how the various potential reduction options could reduce the well-to-wheel carbon footprint.

**Table 2: Estimated GHG Reduction – GHG Offset Program**

| | Average Annual GHG Reduction ($MT\ CO_2e/yr$) | Lifetime GHG Reduction ($MT\ CO_2e$) |
|---|---|---|
| **SCWD** | | |
| Accelerated Alternative Vehicle Purchase | 26 | 500 |
| Biodiesel (B20) | 2 | 47 |
| Behavioral Changes | 12 | 227 |
| **Total** | **41** | **775** |
| **SqCWD** | | |
| Accelerated Alternative Vehicle Purchase | 9 | 170 |
| Biodiesel (B20) | 1 | 16 |
| Behavioral Changes | 4 | 77 |
| **Total** | **14** | **263** |

Source: Well-to-tank emissions factors are based on data from CARB's Low Carbon Fuel Standard program (http://www.arb.ca.gov/fuels/lcfs/workgroups/workgroups.htm#pathways). SqCWD Fleet Fuel Consumption from July 2010 – June 2011 data. SCWD Fleet Fuel Consumption from watervehfuel.xls provided by Keith Van Der Maaten. This analysis is of on-road and in-use vehicles and does not take into consideration tractors, generators, or other machinery, or any vehicles with zero fuel consumption in the baseline year. Also excluded from this analysis is any fuel recorded as "gas card" and not attributed to a specific vehicle.

Note that this project assessment only considers direct GHG emissions. While these strategies reduce the use of gasoline and diesel, they also increase the use of other fuels. Specifically, plug-in hybrids use electricity, and some alternative vehicles use CNG. However, because these strategies reduce the use of fuels that emit the most GHG, there is overall a greater reduction of GHG emissions over time (even if the greater reduction is not counted as part of this project due to additionality).

## Cost

*Capital Cost:* In general, the up-front purchase price of alternative vehicles will be greater than that of conventional vehicles. However, over the lifetime of ownership alternative vehicles offer cost savings through reduced fuel consumption that tends to offset these higher up-front costs. In addition, alternative vehicles tend to have higher resale values.

The primary capital cost is alternative vehicle procurement. SCWD would replace 53 vehicles and SqCWD would replace 30 vehicles, at vehicle costs estimated to range from approximately $50,000 to over $200,000, depending upon the vehicle class. In addition, staff would have to be trained in behavioral changes. The capital cost is estimated to be approximately $5.4 million for SCWD and $3.5 million for SqCWD.

*Annual Costs:* Annual costs will include reduced fuel costs from alternative vehicle replacement, switching to B-20 fuel, and behavioral changes. These savings are estimated to save approximately $22,000 per year for SCWD and $8,000 per year for SqCWD. It is estimated that one quarter FTE would run this program for each agency.

Table 3 summarizes the estimated program costs.

**Table 3: Fleet Fuel Program Costs**

| | Project Life (yrs) | Capital Cost ($) | Average Annual Net Cost ($/yr) | Lifecycle GHG Reduction Cost ($/MT $CO_2$e) |
|---|---|---|---|---|
| SCWD | 20 | $5.4 million | $403,000 | $7,700 |
| SqCWD | 20 | $3.5 million | $290,000 | $28,000 |

## Summary of Advantages and Disadvantages

*Advantages:*

- Reduction of direct and indirect fleet GHG emissions.

*Disadvantages:*

- High capital cost associated with accelerated purchases of alternative vehicles

## References

Tiaxx, LLC (2010). Comparative Costs of 2010 Heavy-Duty Diesel and Natural Gas Technologies at http://www.tiaxllc.com/reports/HDDV_NGVCostComparisonFinalr3.pdf

McKinsey & Company (2010). A Portfolio of Power-Trains for Europe: A Fact-Based Analysis: The Role of Battery Electric Vehicles, Plug-in Hybrids, and Fuel Cell Electric Vehicles at http://www.zeroemissionvehicles.eu/uploads/Power_trains_for_Europe.pdf