ITEM # 7

National Capital Region Transportation Planning Board

777 North Capitol Street, N.E., Suite 300, Washington, D.C. 20002-4290 (202) 962-3310 Fax: (202) 962-3202

October 2, 2015

Memorandum

To: TPB Technical Committee

From: Daivamani Sivasailam
Department of Transportation Planning

Subject: Multi Sector Working Group (MSWG) Transportation Strategies

Attached is a brief description and selected important elements for the ten transportation strategies selected for detailed analysis by the MSWG members and analyzed by ICFI team. For each strategy we extracted a brief description, implementation time frames, implementation actions needed to achieve the benefits, co-benefits, estimated costs, greenhouse gas reduction potential expressed as million metric tons of CO_2equivalent. For strategies TLU 9 through 12 in addition to the above we have included vehicle miles of travel that could be reduced by implementation of the strategy and the accompanying potential increase in transit ridership. These elements were extracted from the draft interim technical report prepared by the ICFI team and presented to the MSWG on July 31, 2015. The ten transportation strategies are:

- TLU-3: Improve Fuel Economy of Light-Duty Vehicle Fleet
- TLU-4: Increase Alternative Fuels in Public Sector Fleets
- TLU-5: Truck Stop Electrification
- TLU-6: Low-Carbon Fuel Standard
- TLU-7: Enhancing System Operations
- TLU-8: Reduce Speeding on Freeways
- TLU-9: Travel Demand Management
- TLU-10: Transit Enhancements
- TLU-11: Transit Incentives / Fare Reductions
- TLU-12: Road Pricing

TLU-3: Improve Fuel Economy of Light-Duty Vehicle Fleet

This strategy is designed to incentivize more fuel-efficient light-duty vehicles in the private sector through programs that a) speed up the replacement rate of older, less fuel-efficient vehicles; b) incentivize the purchase of electric vehicles and charging equipment; c) implement disincentives for inefficient vehicle purchases (e.g. feebates), and; d) adopt new low emission vehicle standards.

Implementation Timeframe: 2016 -2020 (viable)
Increase light-duty zero emission vehicles to 2% of total vehicle population in region (beyond those anticipated with existing policies)

Implementation Timeframe: 2020-2040 (viable)
Increase light-duty zero emission vehicles to 15% of total vehicle population in region (beyond those anticipated with existing policies)

Implementation Timeframe: 2040-2050 (stretch)
Increase light-duty zero emission vehicles to 25% of total vehicle population in region (beyond those anticipated with existing policies)

Implementation Actions to support/promote zero emissions vehicles include:

- Invest in a system of public-access vehicle recharging stations,
- Offer tax credits to businesses that install recharging stations,
- Offer benefits (HOV access, priority parking) to owners of electric vehicles, and offer tax credits for electric vehicle purchases, among others.

Implementation Actions to Incentivize More Fuel Efficient Passenger Vehicles:

- Implement a "Cash for Clunkers" program to encourage replacement of older, less fuel efficient vehicles
- Offer incentives for consumer/private sector purchase of electric vehicles and charging equipment
- Offer incentives for purchases of fuel-efficient vehicles (fee-bates)
- Provide disincentives for purchases of fuel inefficient vehicles (gas guzzler tax/registration fees)
- Adoption of CA Low-Emission Vehicle (LEV) Phase II program

Potential Co-Benefits

- Reduction in criteria air pollutants

Summary of GHG Reduction

Year	Net GHG Reductions (MMTCO2e)
2020 (viable)	0.09
2040 (viable)	0.43
2050 (stretch)	0.64

Costs

Public sector costs are expected to be medium ($50 million to $500 million). Costs include infrastructure improvements for widespread plug-in electric vehicle use and costs for incentives and program implementation costs.

TLU-4: Increase Alternative Fuels in Public Sector Fleets

This strategy is designed to increase the number of alternative fuel vehicles, including zero emission vehicles, in public sector fleets through programs that a) fund purchases of alternative fuel school buses and transit bus fleets; b) convert existing garages and share alternative fuel facilities for school bus fleets, and; c) increase the share of electric vehicles in light-duty public sector fleets (e.g., police cars, government vehicles, etc.).

Implementation Timeframe: 2016 - 2020

- Add 200 zero emission buses to public transit fleet in the study region (replacements).

Implementation Timeframe: 2020 - 2040

- Increase zero emission vehicles in municipal light-duty fleets to 15% of total fleet population; require B5 in all municipal fleets and school buses; require 15% of public transit fleet to be ZEVs.

Implementation Timeframe: 2040 - 2050 (stretch)

- Increase zero emission vehicles in municipal light-duty fleets to 25% of total fleet population; require B20 in all municipal fleets and school buses; require 25% of public transit fleets to be zero emission vehicles.

Potential Co-benefits

- Reduction in criteria air pollutants

Summary of GHG Reduction

Year	GHG Reductions (MMTCO2e)
2020 (viable)	0.007
2040 (viable)	0.047
2050 (stretch)	0.086

Cost:
Costs are estimated to be low (under $50 million) considering incremental costs of vehicle replacements. Costs include incremental costs of purchasing alternative fuel vehicles and costs associated with fueling stations.

TLU-5: Truck Stop Electrification

This strategy is designed to reduce idling by heavy-duty vehicles, specifically through the installation of truck-stop electrification (TSE) sites in the National Capital Region.

Implementation Timeframe: 2016-2020

- One TSE location with 20 bays/site in the region.

Implementation Timeframe: 2020-2040

- Six (6) TSE locations with 20 bays/site in the region.

Implementation Timeframe: 2050 (stretch)

- Fourteen (14) TSE locations with 20 bays/site in the region.(There are currently 14 truck stops located within the metropolitan Washington region17 so the long-term stretch scenario essentially assumes that all are fitted with TSE bays.)

Implementation Actions:

- Adoption of truck stop electrification bays.

Potential Co-benefits:

- Reduction in criteria air pollutants

Summary of GHG Reduction

Year	GHG Reductions (MMTCO2e)
2020 (viable)	< 0.001
2040 (viable)	0.002
2050 (stretch)	0.006

Cost:

Public sector costs are estimated to be low (<$50 million). Installation of TSEs would require public sector expenditures for the infrastructure, as well as on-going operating and maintenance (O&M) costs. Capital costs were estimated as $10,000 per space, and O&M costs per space were $100 for maintenance, $25 for insurance, and $1,314 for overhead labor, based on data for two truck stops in New York, as cited in the Moving Cooler study. These technologies results in cost savings to freight carriers due to reduced vehicle fuel consumption during extended idling. These costs savings can be calculated by multiplying an estimate of annual diesel fuel savings by average diesel fuel costs per gallon.

TLU-6: Low-Carbon Fuel Standard

This strategy is designed to implement market-based programs to reduce the carbon intensity of on-road fuels through the use of lower-carbon alternatives (e.g. natural gas, electricity, biofuels, and hydrogen). This will be accomplished through the adoption of Low Carbon Fuel Standard (LCFS) within the study region.

Implementation Timeframe: 2016-2020

- No reductions (assume measure will not be implemented by this date).

Implementation Timeframe: 2020-2040

- Reduction in total on-road fuel emissions in region by 10%.

Implementation Timeframe: 2040-2050 (stretch)

- Reduction in total on-road fuel emissions in region by 15%.

Implementation Actions:
Implement market-based program to reduce carbon intensity of on-road fuels through use of lower-carbon alternatives (e.g., natural gas, electricity, biofuels, hydrogen)

Potential Co-benefits:

- Reduction in criteria air pollutants
- Economic vitality, jobs, equity

Summary of GHG Reduction

Year	GHG Reductions (MMTCO2e)
2020	0
2040 (viable)	1.02
2050 (stretch)	1.29

Cost:
As a regulatory measure, public sector costs for implementing a low carbon fuel standard are very low (< $50 million). Costs borne on the private sector and consumers are somewhat difficult to estimate given the variety of ways in which a low carbon fuel standard could affect.

TLU-7: Enhancing System Operations

This strategy includes a wide array of strategies to improve the operational performance of freeways and arterial/collectors, including

a) Integrated corridor management on freeway and major arterial corridors;
b) Ramp metering;
c) Signal retiming;
d) Use of roundabouts;
e) Intersection efficiency improvements;
f) Roadway bottleneck improvements;
g) Increased adoption of eco-driving practices by drivers; and
h) Use of connected and autonomous vehicles.

It should be noted that many operational strategies are already in place or anticipated in BAU conditions, so this measure is associated with additional strategy deployments. This analysis did not explicitly examine highway bottleneck improvements, but these improvements might be part of the overall improvement in vehicle operating conditions considered in these scenarios.

Implementation Timeframe: 2016- 2020

- 20% of drivers adopt eco-driving practices (based on public campaigns); region-wide operational improvements reduce vehicle operating emissions by additional 1.65% (based on best available regional simulation study).

Implementation Timeframe: 2020-2040

- 80% of drivers adopt eco-driving practices (based in part via connected vehicle/automated vehicle technologies); region-wide operational improvements reduce vehicle operating emissions by additional 1.65% (based on best available regional simulation study).

Implementation Timeframe: 2040 -2050 (stretch)

- 100% of drivers utilize eco-driving practices (via connected vehicle/automated vehicle technologies); region-wide operational improvements reduce vehicle operating emissions by additional 1.65% (based on best available regional simulation study).

Potential Co-benefits:

- Safety
- Reliability
- Congestion reduction
- Reduction in criteria air pollutants
- Economic vitality, jobs, equity
- Mobility
- Accessibility
- Weather resilient

- Enhanced road weather management and incident management
- Chesapeake Bay/ storm water

Summary of GHG Reduction

Year	GHG Reductions (MMTCO2e)
2020	0.33
2040 (viable)	0.44
2050 (stretch)	0.57

Costs:
Operational strategies are generally low cost, although they can take a wide array of forms. Maryland Climate Action Plan estimated costs of $2.36 million from 2010-2020 associated with corridor/regional operational improvements; costs associated with outreach to promote eco-driving; and costs associated with installing, operating, and maintaining V21 infrastructure. Bottleneck relief projects can vary significantly based on the size and scope of the bottleneck improvement project and can range from low (under $50 million) to medium ($50 million to $500 million).

TLU-8 Reduce Speeding on Freeways

This strategy is designed to provide greater enforcements of speed limits on freeways in the metropolitan Washington, DC region. Vehicle fuel economy degrades considerably at speeds above 55 mph, so freeway speed reduction has been proposed as a viable GHG reduction strategy in national studies. According to the Department of Energy, going from 60 to 70 mph degrades vehicle fuel economy by 13.6%, and going from 50 to 70 mph degrades fuel economy by 24.5%. In metropolitan Washington, DC region, very few highways operate at posted speeds above 55 mph, largely outside of the urbanized area (e.g., a portion of I-95 in Maryland beyond the Capital Beltway, a portion of I-270 beyond Clarksburg), as well as the Express Lanes that operate along the Capital Beltway and I-95 in Virginia. Consequently, this strategy would be implemented through increased speed enforcement, which may include more speed patrols and/or electronic monitoring of freeway speeds.

Implementation Timeframe: 2016- 2020

- One-third of freeway speeding eliminated

Implementation Timeframe: 2020-2040

- All freeway speeding eliminated (through automated enforcement/autonomous vehicles)

Implementation Timeframe: 2040 - 2050

- All freeway speeding eliminated (through automated enforcement/autonomous vehicles)

Implementation Actions:
Increased speed enforcement, which may include more speed patrols and/or electronic monitoring of freeway speeds.

Potential Co-Benefits:

- Safety
- Reduction in some criteria air pollutants

Summary of GHG Reduction

Year	GHG Reductions (MMTCO2e)
2020	0.004
2040 (viable)	0.005
2050 (stretch)	0.004

Costs:
Reducing speeding will require additional highway speed enforcement, whether through deployment of additional law enforcement staff or electronic monitoring. Costs could range from low (under $50 million) to medium ($50 to $500 million).

TLU-9: Travel Demand Management

This strategy encompasses a wide range of strategies designed to reduce vehicle travel by shifting motorists to higher-occupancy modes (carpools, vanpools), public transit, walking, and bicycling, as well as telecommuting.

Implementation time frame: 2016 to 2020 (viable)

- 50% of parking in activity centers is priced at an average of $8 per day
- Expand employer-based incentives to cover 40% of employees in the region receiving a subsidy of $50/month for transit, carpool, vanpool, etc.

Implementation time frame: 2020 to 2040 (viable)

- 90% of parking in activity centers is priced at an average of $8 per day
- Expand employer-based incentives to cover 80% of employees in the region receiving a subsidy of $50/month for transit, carpool, vanpool, etc.

Implementation time frame: 2040 to 2050 (stretch)

- 100% of parking in activity centers is priced at an average of $8 per day
- Expand employer-based incentives to cover 100% of employees in the region receiving a subsidy of $80/month for transit, carpool, vanpool, etc.

Tool Used: TRIMMS sketch planning model

Implementation Actions:

- Encourage employers to offer incentives to employees to switch to carpooling/vanpooling, non-motorized modes, and telecommuting.
- Incentives to employers to offer or ordinances to require employers to offer parking cash out / transit benefits
- Expansion of Park-and-ride facilities to meet anticipated increase in rideshare and transit demand
- Incentives or ordinances such as parking tax, parking impact fees, parking caps to reduce free parking in activity centers to realize the above assumptions.

Potential Co-Benefits:

- Congestion reduction
- Reduction in criteria air pollutants
- Economic vitality, jobs, equity
- Mobility
- Accessibility
- Weather resilient
- Chesapeake Bay/storm water

Summary of Travel Impacts and GHG Reduction

Year	VMT Reduced	Percent Reduction in VMT from Regional Base	Percentage Increase In Transit Trips	GHG Reductions (MMTCO2e)
2020 (viable)	329,421,805	0.9%	2.2%	0.13
2040 (viable)	986,254,766	2.4%	7.0%	0.24
2050 (stretch)	2,172,646,698	5.3%	38.5%	0.54

Cost: Annual Cost is estimated as low. Only the cost of incentives to the public sector is taken into account. Increase transit service cost could be off-set by the parking tax. Loss of revenue from lower gas tax collection from VMT reduction is possible.

Note: The current employer outreach program in the region which promotes TDM program similar to the above on a voluntary basis through the "Employer Outreach" TERM estimates a daily VMT reduction of 1,327,000 or an annual reduction of 331,750,000 due to the program. This program has been in operation for over 12 years and the program aims to maintain the criteria pollutant goal set as part of transportation conformity.

TLU-10: Transit Enhancements

This strategy is designed to increase the share of transit trips through increased or improved services. For this analysis, the focus on transit enhancements that reduce transit travel times and reliability, as well as schedule improvements to reduce wait-times, rather than expansions to services.

Implementation time frame: 2016 to 2020 (viable)

- Reduce transit travel and wait times by 10%

Implementation time frame: 2020 to 2040 (viable)

- Reduce transit travel and wait times by 15%

Implementation time frame: 2040 to 2050 (stretch)

- Reduce transit travel and wait times by 20%

Tool Used: TRIMMS sketch planning model
Implementation Actions:

Strategies may include: a) increased circulator buses; b) enhanced commuter bus services; c) real-time bus schedule information; d) transit signal priority improvements; e) bus rapid transit improvements; f) expanded Metrorail/commuter rail; g) bus stop improvements; h) schedule coordination between transit agencies; i) permitting buses on highway shoulders; j) transit access improvements; k) establishing dedicated bus lanes; and l) bus infrastructure commitments.

Potential Co-Benefits:

- Reliability
- Congestion reduction
- Reduction in criteria air pollutants
- Economic vitality, jobs, equity
- Mobility
- Accessibility
- Community amenity

Summary of Travel Impacts and GHG Reduction

Year	VMT Reduced	Percent Reduction in VMT from Regional Base	Percentage Increase In Transit Trips	GHG Reductions (MMTCO2e)
2020 (viable)	146,071,834	0.4%	2.2%	0.06
2040 (viable)	2,347,634,698	0.6%	3.4%	0.06
2050 (stretch)	3,285,301,773	0.8%	4.7%	0.08

Cost: Annual Cost is estimated as High. Even though some enhancements can be low cost, BRT and Transit Signal Priority and corridor treatments can be high.

Note: TIGER is implementing signal priority projects along high transit corridors and could be operational in a year.

TLU-11: Transit Incentives / Fare Reductions

This strategy is designed to attract transit ridership and use through lower fares, such as a) reduced price monthly transit passes; b) free bus-rail transfers, and c) free off-peak bus service.

Implementation time frame: 2016 to 2020 (viable)

- Reduce transit fares regionally by 20%.

Implementation time frame: 2020 to 2040 (viable)

- Reduce transit fares regionally by 25%

Implementation time frame: 2040 to 2050 (stretch)

- Reduce transit fares regionally by 40% partially funded through pricing strategies

Tool Used: TRIMMS sketch planning model

Implementation Actions:

- Reduced price monthly transit passes
- Free bus-rail transfers
- Free or reduced price off-peak bus service

Potential Co-Benefits:

- Congestion reduction
- Reduction in criteria air pollutants
- Mobility
- Accessibility
- Chesapeake Bay/storm water

Summary of Travel Impacts and GHG Reduction

Year	VMT Reduced	Percent Reduction in VMT from Regional Base	Percentage Increase In Transit Trips	GHG Reductions (MMTCO2e)
2020 (viable)	319,893,592	0.8%	4.6%	0.12
2040 (viable)	4,256,572,927	1.0%	5.9%	0.10
2050 (stretch)	7,645,668,979	1.8%	10.8%	0.19

Cost: Annual Cost is estimated as low. Only the cost of incentives to the public sector is taken into account. Increase transit service cost could be off-set by the parking tax. Loss of revenue from lower gas tax collection from VMT reduction is possible.

TLU-12: Road Pricing

This strategy is designed to implement road pricing measures and adding roadway pricing (i.e. cordon pricing) to enter major activity centers across the region such as: a) electronic tolling of major bridges and connectors; b) conversion to full electronic tolling; and c) VMT-based vehicle fees, including Pay-As- You-Drive insurance

Implementation time frame: 2016 to 2020 (viable)

- Nothing new will be implemented as part of this strategy by 2020

Implementation time frame: 2020 to 2040 (viable)

- Cordon pricing into downtown DC at $5/trip

Implementation time frame: 2040 to 2050 (stretch)

- In addition to the cordon pricing, VMT charge of $0.10/mile on all roads.

Tool Used: TRIMMS sketch planning model
Implementation Actions:

- Conversion to full electronic tolling in the region
- Implementation of the District of Columbia's $ 5/vehicle cordon pricing for all vehicles
- Implementation of VMT charge of $ 0.10/mile on all roads

Potential Co-Benefits:

- Safety
- Reliability
- Congestion Reduction
- Reduction in criteria air pollutants
- Chesapeake Bay/storm water

Summary of Travel Impacts and GHG Reduction

Year	VMT Reduced	Percent Reduction in VMT from Regional Base	Percentage Increase In Transit Trips	GHG Reductions (MMTCO2e)
2020 (viable)	none	None	none	None
2040 (viable)	1,380,300	0.3%	8.6%	0.06
2050 (stretch)	1,898,793	7.8%	25.2%	0.08

Cost: Public sector cost would be low after paying for transportation improvements using revenue generated from tolls and VMT fees. Private sector costs could be high