Short Lived Climate Pollutants:

Statewide Impacts of 90% Organics Diversion by 2025

California's Air Resources Board (CARB) released its Concept Paper "Short-Lived Climate Pollutant Reduction Strategy" on May 7, 2015 in response to Senate Bill 605 (SB 605, Lara, 2014). After a series of public workshops and input, CARB amended the paper and released their "Draft Strategy" on September 30, 2015. In their efforts, CARB identified Short-Lived Climate Pollutants (SLCP) such as methane, fluorinated gases, black carbon, and tropospheric ozone as priority targets for greenhouse gas abatement. Compared to carbon dioxide, these gases remain in the atmosphere for a much shorter period of time, and have a greater relative potency. CARB's Draft Strategy estimates that 40% of the global warming experienced to date may have occurred as a result of SLCP and recommends the following strategy for methane mitigation:

"For landfills, CARB will work with CalRecycle to develop a regulation by 2018 to progress towards existing State targets for landfill diversion by 2020, and effectively eliminate organic disposal in landfills by 2025" – Page E-8 of the Draft Strategy

Edgar & Associates represent the California Compost Coalition, and is the engineer for many private independent compost and recycling companies statewide. The compost industry supports the Draft Strategies in the SLCP Paper and is poised to assist in developing over 100 facilities over the five years to reach the 2020 goal, and another 100 facilities by 2025 to reach the 2025 goal.

The projected result of this diversion strategy to effectively eliminate 90% of the organics by 2025 is over **8 million tons** in 2020 and **14.5 million tons** in 2025, and when measured in avoided metric tons of carbon dioxide ($MTCO_2e$) is **4.3 million $MTCO_2e$** by 2020 and **7.8 million $MTCO_2e$** by 2025.

	AB 1826, AB 341 2020	SB 605, AB 1594 2025
Diverted Tons	8,014,732 tons	14,536,565 tons
$MTCO_2e$ Avoided	4,295,486	7,791,292

Short-Lived Climate Pollutant Strategy

In light of climatological impact of SLCP and Governor Brown's 2030 target of reaching 40% below 1990 greenhouse gas levels, CARB has declared several SLCP reduction measures that will be included in CARB's climate strategy. Among these measures, methane is targeted specifically with the following goals and strategies:

"Effectively eliminate the disposal of organics in landfills by 2025, by diverting at least 75 percent of the organic materials from landfills by 2020, and 90 percent by 2025" Page 49 of the Draft Strategy

The Draft Strategy recognizes the many co-benefits:

Reducing methane emissions and harnessing captured methane can help meet multiple objectives, from reducing SLCP emissions to reducing air pollution, improving soil health, and increasing the supply of California-produced biofuels. Doing so can also improve air quality and water quality and generate valuable, local, renewable energy and soil amendment products. While barriers remain that limit market-based solutions to put organic waste streams to beneficial use, collaborative efforts to overcome them could open valuable markets that could help to scale solutions to reduce emissions of SLCPs. Products from organic waste streams in California, and potential environmental credits from them, could represent a billion dollar market for California dairies and other project developers. Developing infrastructure to enable these markets could lead to significant investment in the State, much of it concentrated in the Central Valley. In order to fully realize these economic and environmental benefits, California must work to overcome obstacles to financing and developing projects that use organic waste streams.

Diverting organic wastes can provide a variety of environmental and economic benefits. Composting returns nutrients to the soil, builds soil organic matter, improves water holding capacity, and increases carbon sequestration in the landscape. The anaerobic digestion of organic waste can also support the State's efforts to obtain at least 50 percent of its electricity from renewable resources, aid in reducing the carbon intensity of transportation fuels, and displace fossil natural gas consumption. As described in Chapter 2, eliminating the disposal of organics in landfills as part of a broad effort to put California's organic waste streams to beneficial use can generate thousands of jobs and provide billions of dollars in value, much of it concentrated in the Central Valley and other rural areas.

Towards this end, several SLCP Draft Strategy recommendations coupled with current laws have been developed to phase in collection to 2020 and identify organic processing capacity to 2030, including:

- AB 341, 2011 – Statewide goal of reaching a 75% recycling rate by 2020 not counting ADC or beneficial reuse of green waste as diversion
- AB 1826, 2014 – Sets a goal of diverting half of 2014's commercial organics disposal by 2020 with phased-in mandatory collection.
- AB 1594, 2014 – No longer granting green waste alternative daily cover (ADC) diversion credit, and counting these tons as disposal after 2020.
- AB 876, 2015 – Local jurisdictions to identify 15 years of organic processing capacity

Greenhouse Gas Implications of a 90% Reduction in Organics Disposal

The above recommendations can be quantified in terms of greenhouse gases using the most up-to-date estimation data and metrics provided by CARB, the United States Environmental Protection Agency, CalRecycle, and the California Department of Finance. The information from these sources produces the following calculation:

Projected Generation × 50% reduction in 2020 × Organic Waste Emission Reduction Factors = Avoided Emissions

Projected Generation × 90% Reduction in 2025 × Organic Waste Emission Reduction Factors = Avoided Emissions

The projected result of this organics diversion, measured in avoided metric tons of carbon dioxide ($MTCO_2e$) is **4,295,486 $MTCO_2e$** by 2020 and **7,791,292 $MTCO_2e$** by 2025.

	AB 1826, AB 341 2020	**SB 605, AB 1594 2025**
Diverted Tons	8,014,732 tons	14,536,565 tons
$MTCO_2e$ Avoided	4,295,486	7,791,292

Projected Generation: Organics generation is modelled as a function of population (Department of Finance projections), annual disposal weights (CalRecycle DRS), and Waste Characterization by sector (CalRecycle).

CalRecycle's 2014 preliminary draft Waste Characterization estimates that 11,913,612 tons of material are disposed of in the commercial sector annually. Of this, 43% is organic materials. This includes material such as food, yard waste, grass, compostable paper, wood, and manure.

CalRecycle's website indicates that 30,864,279 tons were disposed of in 2014. According to CalRecycle's update to the 2014 Waste Characterization, commercial waste constitutes 38.6% of the total waste stream, with residential and self-haul making up the remaining 47.0% and 14.4% respectively.

The 2014 Waste Characterization and CalRecycle's Disposal Reporting Service can be used to obtain an estimate of overall statewide organics disposal. These tonnages, adjusted by population projections from the Department of Finance, are used to calculate a 2020 and 2025 business-as-usual projection of organics disposal.

Summaries of the waste characterizations used in this analysis are provided in the tables below.

CalRecycle 2014 Waste Characterization: Organic Portion of Waste Stream	
Food Waste	18%
Yard Waste	7%
Lumber	14%
Compostable Paper	4%
Manure	0.6%
	43%

New Organics Diversion			
	2014	**2020**	**2025**
Organics Disposal Baseline	13,322,296	13,976,793	14,581,386
AB 1826 & SB 605 Targets		6,661,148	1,332,230
New Diversion		**7,315,646**	**13,249,157**

Green Waste ADC Diversion (tons)			
	2014	**2020**	**2025**
Green Waste ADC Disposal Baseline	1,294,515	1,358,112	1,416,860
SB 605 Target (10% of 2014 Level)	1,294,515	659,026	129,452
New Diversion	**0**	**699,086**	**1,287,408**

TOTAL NEW TONS			
	2014	**2020**	**2025**
Total New Diversion	**0**	**8,014,732**	**14,536,565**

2014 Organics Disposal By Sector (tons)				
Material	**Commercial**	**Residential**	**Self-Haul**	**Total**
Food Waste	2,158,195	2,627,854	805,130	5,591,179
Yard Waste	824,182	1,003,538	307,467	2,135,187
Lumber	1,623,208	1,976,445	605,549	4,205,203
Compostable Paper	469,345	571,482	175,092	1,215,919
Manure	67,476	82,160	25,172	174,808
TOTAL:	**5,142,406**	**6,261,479**	**1,918,411**	**13,322,296**

2020 Projected Business-as-Usual Organics Disposal by Sector (tons)				
Material	**Commercial**	**Residential**	**Self-Haul**	**Total**
Food Waste	2,264,223	2,756,955	844,684	5,865,862
Yard Waste	864,673	1,052,840	322,572	2,240,084
Lumber	1,702,953	2,073,544	635,299	4,411,796
Compostable Paper	492,403	599,558	183,694	1,275,655
Manure	70,791	86,196	26,409	183,396
TOTAL:	**5,395,042**	**6,569,093**	**2,012,658**	**13,976,793**

2025 Projected Business-as-Usual Organics Disposal by Sector (tons)				
Material	**Commercial**	**Residential**	**Self-Haul**	**Total**
Food Waste	2,362,166	2,876,213	881,223	6,119,601
Yard Waste	902,076	1,098,382	336,526	2,336,984
Lumber	1,776,618	2,163,239	662,780	4,602,637
Compostable Paper	513,703	625,493	191,640	1,330,836
Manure	73,853	89,925	27,551	191,329
TOTAL:	**5,628,415**	**6,853,252**	**2,099,720**	**14,581,386**

AB 341 and AB 1826 to 2020:

The SLCP Plan to considering measures to meet a goal of diverting 90% of organics from landfills through source reduction and organics recycling by 2025, can be accomplished by recognizing and successfully implementing the current goals for 2020. AB 341 has set a statewide goal to recycle or compost 75% of the waste stream by 2020. AB 1826 mandates that more than half of the commercial organic waste be collected by 2020.

The projected result of this organics diversion is **8,014,732 new tons** by 2020, and measured in avoided metric tons of carbon dioxide ($MTCO_2e$) is **4,062,656 $MTCO_2e$** by 2020.

The AB 32 Scoping Plan First Update adopted in 2014 calls for **5.0 to 7.5 million tons** of food waste and green waste be diverted by 2020 (50% to 75% diversion), which results in avoiding between **3.03 to 5.62 $MMTCO_2e$** being avoided (Copy attached). At least 100 new or expanded compost and anaerobic digestion facilities will be needed by 2020. Note that lumber (1.73 million tons) and compostable paper (1.28 million) were not included in these AB 32

calculations by CARB. As CARB updates the Scoping Plan this summer to accommodate the Governor's Executive Order B-30-15 to provide a framework for achieving the 2030 target to achieve a 40% reduction below 1990 levels by 2030. CARB should harmonize AB 341, AB 1826 SB 605 and AB 867 programs into the AB 32 Scoping Plan update to 2030, which has kicked-off and should be ready for consideration in fall 2016.

SB 605 - 90% Reduction by 2025: Building upon AB 341 and AB 1826 to get to the 2020 goals, and recognizing green waste alternative daily cover counting as disposal after 2020, the SLCP Plan goal of diverting 90% of organics from landfills through source reduction and organics recycling by 2025 is achievable. The organic waste disposal from the commercial, residential, and self-haul sectors when reduced to 10% of their 2014 levels reaches a total reduction of **14,536,565 tons** by 2025, and measured in avoided metric tons of carbon dioxide ($MTCO_2e$) is **7,791,292 $MTCO_2e$** by 2025.

Another 100 new or expanded compost and anaerobic digestion facilities will be needed between 2020 and 2025. With regulatory streamlining among the Air Boards and the Water Boards at Cal-EPA per recently passed AB 1045, and with increased cap-and-trade revenue allocation towards composting, anaerobic digestion and renewable natural gas production facilities, the industry is poised to achieve these goals much like achieving the AB 939 recycling goals of the nineties.

Implementing AB 32

According to "Projection from Staff Report - California 1990 Greenhouse Gas Emissions Level and 2020 Emissions Limit" released by CARB on November 16 2007, 169 $MMTCO_2e$ needs to be reduced to reach AB 32's goal of 431 $MTCO_2e$.

- The 50% reduction in commercial organic waste disposal and residential and self-haul organics called for in AB 1826 would result in 4 $MMTCO_2e$ avoided in 2020. This will accomplish 2.6% of AB 32's required emissions reductions and meet the AB 32 Scoping Plan goals.
- The 90% reduction in organics from landfills would result in 7.3 $MMTCO_2e$ avoided in 2025.

The US EPA's Waste Reduction Model (WARM) is used to calculate the avoided landfill emissions of methane of these materials, without carbon storage credit. CARB's metrics are used to estimate avoided emissions from the end use of these organics materials, either as avoided emissions from compost use or as offset energy emissions from biomass combustion. These factors below are used to calculate the total emissions reductions resulting from the 90% reduction in organics disposal.

Organic Waste Emissions Factors: Using CalRecycle's Waste Characterization categories, organic waste is grouped into five emission factor groups to calculate avoided emissions. Each group, and its per-ton reductions in $MTCO_2e$, is listed below.

PER TON AVOIDED EMISSIONS			
Material	Avoided Landfill Emissions **(EPA –WARM)**	Avoided Emissions From End Use **(CARB)**	Avoided Emissions Per Ton
Food Waste	-0.25	-0.42	-0.67
Yard Trimmings & Greenwaste ADC	-0.14	-0.42	-0.56
Lumber	-0.05	-0.21	-0.26
Compostable Paper	-0.11	-0.42	-0.53
Manure	0.00	-0.42	-0.42

*End uses of wood materials are modelled as combusted for energy rather than composted.

Ultimately under a 90% reduction in disposal, these sectors reduce emissions by7,074,887 $MTCO_2e$. The remaining reduction of 716,406 $MTCO_2e$ is attributable to a similar 90% reduction in the use of green waste as alternative daily cover. The 1,287,408 tons of reduced green material from landfills is modelled using the -.5565 emission factor for "yard trimmings".

References:

- California Air Resources Board, "Method for Estimating Greenhouse Gas Reductions from Compost from Commercial Organic Waste", November 14, 2011.
- California Air Resources Board, "Method for Estimating Greenhouse Gas Emissions Reductions from Recycling", November 14, 2011.
- California Air Resources Board, "Projection from Staff Report - California 1990 Greenhouse Gas Emissions Level and 2020 Emissions Limit", November 16 2007
- California Department of Finance, Demographic Research Unit, "State and County Total Population Projections by Race/Ethnicity and Detailed Age", December 15, 2014. http://www.dof.ca.gov/research/demographic/reports/projections/P-3/
- California Department of Resource Recovery (CalRecycle), Data Central: Statewide Disposal Amounts, http://www.calrecycle.ca.gov/DataCentral/Materials.htm
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  United States Environmental Protection Agency, "Waste Reduction Model" (WARM), March 2015.