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Project Description Data

Polystyrene Use in San Diego	Units
4.4	pounds of polystyrene per person per year

Notes:
Based on halfway between the national average (1.8 to 7 lbs per person per year)
Source: The Resin Review 2012
The Resin Review, 2012 Edition
[1] For the purpose of this initial study, it is assumed that all polystyrene is EPS foam because there are no other reasonable polystyrene (rigid or film) data available. This is a conservative approach because the basis of the analysis is in part weight-based and EPS foam is generally lighter than rigid polystyrene. Although EPS foam is not necessarily lighter than EPS film, EPS film is likely not widely used by food service providers in the City. Instead, it would be more likely that polystyrene film would be found on pre-packaged food items.

Population of San Diego:	1,425,976

Source: Quick Facts. https://www.census.gov/quickfacts/fact/table/sandiegocitycalifornia/PST045218#PST045218. Accessed May 2020.

Pounds of Polystyrene Per Year	6,274,294

TABLE 1: POTENTIAL INCREASED PRODUCT WEIGHT ASSOCIATED WITH ORDINANCE

	Existing Conditions	Proposed Ordinance		
Material Type	Polystyrene	Paper	Plastic	Total
Weight (lb)	6,270,000	0	15,675,000	15,675,000
Net Change (lb)		9,405,000		

4702.5

Per historical information from curbside recycling waste streams, it is estimated that paper materials (cardboard and mixed paper) make up approximatley 46% of the waste stream while plastics make up 3%. However, the analysis conservatively assumed the existing polystyrene use would be replaced by plastic products (heavier alternative than paper products).

Disposal Rates

6.4	pounds per person per year	Mountain View and Sunnyvale
6	pounds per person per year	New York City

Source:
Resource Recycling. 2017. The Rise of EPS Ordinances. https://resource-recycling.com/recycling/2017/02/06/rise-eps-ordinances/. Accessed May 2020.

Table 3.1-8

Net Increase in Annual Emissions Associated with Implementation of the Ordinance

Description	ROG	NO_x	CO	SO_x	PM_{10}	$PM_{2.5}$
	tons per year					
Proposed Ordinance: Delivery to Local Retailers Emissions	0.00	0.14	0.01	0.00	0.21	0.05
Proposed Ordinance: Disposal/Transportation to the Landfill	0.00	0.20	0.18	0.00	0.05	0.01
Total Emissions	0.01	0.35	0.20	0.00	0.26	0.07
Existing Emissions (Polystyrene)	0.00	0.14	0.08	0.00	0.10	0.03
Net Increase in Emissions	**0.00**	**0.21**	**0.12**	**0.00**	**0.16**	**0.04**
City of San Diego Thresholds	15	40	100	40	15	10
Exceeds Thresholds?	No	No	No	No	No	No

Table 3.1-9

Net Increase in Daily Emissions Associated with Implementation of the Ordinance

Description	ROG	NO_x	CO	SO_x	PM_{10}	$PM_{2.5}$
	tons per year					
Proposed Ordinance: Delivery to Local Retailers Emissions	0.02	1.11	0.09	0.01	1.65	0.42
Proposed Ordinance: Disposal/Transportation to the Landfill	0.01	1.29	1.19	0.00	0.30	0.08
Total Emissions	0.04	2.41	1.28	0.01	1.95	0.50
Existing Emissions (Polystyrene)	0.01	0.96	0.51	0.00	0.78	0.20
Net Increase in Emissions	**0.02**	**1.44**	**0.77**	**0.01**	**1.17**	**0.30**
City of San Diego Thresholds	137	250	550	250	100	67
Exceeds Thresholds?	No	No	No	No	No	No

Table 3.2-3

Net Increase in Emissions Associated with Implementation of the Ordinance

Description	GHG Emissions (MT CO_2e)
Proposed Ordinance: Delivery to Local Retailers	106
Proposed Ordinance: Disposal/Transport to the Landfill	69
Total Emissions	1831
Existing Emissions (Polystyrene)	70
Net Increase in Emissions	**1761**

Notes: MT CO_2e = metric tons carbon dioxide equivalent

March 2021 Recyling Waste Stream Information

Material Type	Percentage	Tons
Newspaper	25.90%	1338.47
Cardboard	15.16%	783.44
Mixed Paper	31.01%	1602.51
Aluminum Scrap	0.16%	8.09
Aluminum CRV	0.27%	14.12
Tin	1.04%	53.6
Flint Glass Scrap	0.36%	18.41
Flint Glass CRV	0.15%	7.53
Brown Glass Scrap	0.20%	10.46
Brown Glass CRV	0.07%	3.77
Green Glass Scrap	0.49%	25.13
Green Glass CRV	0.21%	10.97
Three Mix Glass Scrap	10.18%	525.96
Three Mix Glass CRV	2.08%	107.58
PET Scrap	0.94%	48.35
PET CRV	0.41%	21.25
HDPE Natural Scrap	0.54%	28.01
HDPE Natural CRV	0.02%	0.85
HDPE Color Scrap	0.78%	40.2
HDPE Color CRV	0.02%	1.08
Plastics #3-7	0.23%	12.04
Cartons	0.25%	12.96
Rigid Plastic	0.30%	15.65
EPS	0.09%	4.87
Metal	0.44%	22.84
Contamination	23.87%	1233.49
Total Tons		**5951.63**

Source: Email communication Jennifer Ott-Rol and Justin Ono (City of San Diego 2021). May 13, 2021

Mobile Source Emissions Associated with Delivery to Local Retailers

Annual Existing Polystyrene Weight (lbs)	**6,270,000**
Annual Delivery Truck Round Trips	131
Annual Delivery One-Way Truck Trips	**261**

Annual	Paper (lbs)	Plastic (lbs)
Proposed Ordinance	0	15,675,000
Delivery Truck Round Trips	0	327
Total One-Way Truck Trips	**653**	

196

Annual Mobile Source Emission Estimates Associated with Delivery to Local Retailers						
tons per year						**MT per year**
ROG	**NOx**	**CO**	**SOx**	**PM10**	**PM2.5**	**CO2e**
Existing Polystyrene Delivery Emissions						
0.00	0.06	0.00	0.00	0.09	0.02	42.48
Proposed Ordinance Delivery Emissions						
0.00	0.14	0.01	0.00	0.21	0.05	106.19
Net Change						
0.00	**0.09**	**0.01**	**0.00**	**0.13**	**0.03**	**63.72**

Daily Mobile Source Emission Estimates Associated with Delivery to Local Retailers					
pounds per day					
ROG	**NOx**	**CO**	**SOx**	**PM10**	**PM2.5**
Existing Polystyrene Delivery Emissions					
0.01	0.44	0.04	0.00	0.66	0.17
Proposed Ordinance Delivery Emissions					
0.02	1.11	0.09	0.01	1.65	0.42
Net Change					
0.01	**0.67**	**0.06**	**0.00**	**0.99**	**0.25**

Emission Factors (grams/mile)							
Vehicle Type	ROG	NOx	CO	SOx	PM10	PM2.5	CO2e
T7 Single Unit Truck	0.043326426	2.157789331	0.181171467	0.0158917	3.2032406	0.816660107	1748.334646

Notes: Conservatively assumes 100% of delivery trucks are diesel-fueled.
PM emissions include travel on paved roads.

CO2	CH4	N2O
1678.211528	0.0020124	0.26440291

Average delivery to local retailers trip length (miles)	93
Estimated Weight Capacity per Delivery Truck (lbs)	48,000
Days of Transport per Year (5 days per week)	260

Notes: Assumes that food and beverage containers are transported via a standard 53-foot delivery truck, which has a maximum load capacity of approximately 48,000 pounds (City of San Diego Initial Study Checklist).
Trip distance for delivery to local retailers conservatively assumed to be distance between City of Encinitas (location of local distributor) to edge of air district.

GWP Values	
CO2	1
N2O	265
CH4	28

Conversion Factors	
g	ton
907185	1
lbs	MT
2204.62	1
g	MT
1.00E+06	1
lbs	ton
2000	1

Sources:
https://afdc.energy.gov/data/10380

Mobile Source Emissions Associated with Disposal to Landfill

Annual Existing Polystyrene Weight (lbs)	**6,270,000**
Annual Round Trips	224
Annual Truck Trips	**448**

Annual	Paper (lbs)	Plastic (lbs)
Proposed Ordinance	0	15,675,000
Truck Round Trips	0	560
Total One-Way Truck Trips	**1120**	

Annual Mobile Source Emission Estimates Associated with Disposal to Landfill/Recycling Center						
tons per year						**MT per year**
ROG	**NOx**	**CO**	**SOx**	**PM10**	**PM2.5**	**CO2e**
Existing Polystyrene Delivery Emissions						
0.00	0.08	0.07	0.00	0.02	0.00	27.74
Proposed Ordinance Delivery Emissions						
0.00	0.20	0.18	0.00	0.05	0.01	69.35
Net Change						
0.00	**0.12**	**0.11**	**0.00**	**0.03**	**0.01**	**41.61**

Daily Mobile Source Emission Estimates Associated with Disposal to Landfill/Recycling Center					
pounds per day					
ROG	**NOx**	**CO**	**SOx**	**PM10**	**PM2.5**
Existing Polystyrene Delivery Emissions					
0.01	0.52	0.47	0.00	0.12	0.03
Proposed Ordinance Delivery Emissions					
0.01	1.29	1.19	0.00	0.30	0.08
Net Change					
0.01	**0.78**	**0.71**	**0.00**	**0.18**	**0.05**

Emission Factors (grams/mile)							
Vehicle Type	ROG	NOx	CO	SOx	PM10	PM2.5	CO2e
T7 SWCV	0.097914529	8.665973861	7.939434251	0.022032394	2.0192555	0.525474042	3282.813492

Notes: Assumes solid waste collection vehicles are 55% diesel fueled and 45% natural gas powered per EMFAC2021 data for San Diego County in 2021.
PM emissions include travel on paved roads.

CO2	CH4	N2O
3096.26036	1.708505432	0.523452755

Assumed trip length (miles)	18.87
Estimated Weight Capacity per SWCV (lbs)	28,000
Days of Transport per Year (6 days per week)	312

Notes: Assumes that all containers are disposed at a landfill/recycling center.

Distance between City and Landfill (miles)		**% of Material Disposed at Facility**
Miramar Landfill	15.6	53%
Otay Landfill	24.7	31%
Sycamore Landfill	18.4	16%

Distance between City and Recycling Center (miles)	
EDCO Recyling	7.0
Allan Company	17.2
IMS Recycling Services, Inc.	4.0

Source: https://www.sandiego.gov/sites/default/files/legacy/environmental-services/geninfo/pdf/draftnondisfacelement.pdf

Trip distance based on the weighted average trip distance between City of San Diego and Miramar Landfill, Otay Landfill, and Sycamore Landfill (which is more conservative than the distance between City of San Diego and recycling centers).
https://www.sandiego.gov/sites/default/files/legacy/environmental-services/pdf/wastemanagementhistory.pdf
Weight capacity of SWCV based on 14 tons of waste per https://scdhec.gov/environment/land-and-waste-landfills/how-landfills-work

The County developed a network of landfills, which, by 1990, included a large landfill in the northern part of the County (San Marcos), one in the east (Sycamore, located in the City of San Diego, adjacent to Santee), and another in the south (Otay, located with the City of Chula Vista on land that is unincorporated). This network, together with the City's Miramar Landfill in the center of the City of San Diego's population, allowed relatively short collection routes. Based on CalRecycle 2020 Jurisdiction Disposal and Beneficial Reuse by Destination data, these landfills are the destination facility for 93% of the material.

GWP Values	
CO2	1
N2O	265
CH4	28

Conversion Factors	
g	ton
907185	1
lbs	MT
2204.62	1
g	MT
1.00E+06	1
lbs	ton
2000	1

Sources:
https://afdc.energy.gov/data/10380

Indirect GHG Emissions from Disposal at Landfill

Annual Existing Polystyrene Weight (lbs)		**6,270,000**
Annual	Paper (lbs)	Plastic (lbs)
Proposed Ordinance	15,048,000	15,675,000

Note: Analysis conservatively assume replacement products are 100% paper.

Landfilling Emission Factors for Paper Products (MT CO2e/Short Ton)

Material	**Landfill CH4**	**Avoided CO2 Emissions from Energy Recorvery**	**Landfill Carbon Storage**	**Net Emissions (Post-Consumer)**
Corrugated Containers	1.05	-0.11	-0.72	0.22

Notes: Emission Factors from EPA GHG Emission Factors used in the WARM tool (February 2016) Exhibit 3-26

Does not include transportation to landfill as those emissions are calculated in Mobile-Disposal tab using emission factors specific to San Diego County

WARM calculates emission factors for each of these three landfill types and uses the national average mix of collection systems installed at landfills in the United States to calculate a national average emission factor that accounts for the extent to which CH4 is not captured, is flared without energy recovery, or is combusted onsite for energy recovery.

Because plastics do not contain biodegradable carbon, they do not generate CH4 and are not considered to store any carbon when landfilled. The only emissions associated with landfilling plastics are from transportation to the landfill and moving waste in the landfill (calculated in Mobile-Disposal tab).

Proposed Ordinance	Annual Disposal (tons)	GHG Emissions (MT CO2e)*
Paper	7524	**1,655**

*Total emissions associated with landfilling and degradation of paper products

Conversion Factors	
kg to pounds	2.20462
g per pound	453.592
tons to metric tons	0.907185
pounds per ton	2000
pounds per metric ton	2204.62262
months per year	12
days per year	365
Global Warming Potential	
CO2	1
Ch4	28
N20	265

Exhibit 3-26: Landfilling Emission Factors for Paper Products ($MTCO_2E$/Short Ton)

Material	Raw Material Acquisition and Manufacturing (Current Mix of Inputs)	Transportation to Landfill	Landfill CH_4	Avoided CO_2 Emissions from Energy Recovery	Landfill Carbon Storage	Net Emissions (Post-Consumer)
Corrugated Containers	–	0.02	1.05	-0.11	-0.72	0.23
Magazines/Third-Class Mail	–	0.02	0.48	-0.05	-0.85	-0.39
Newspaper	–	0.02	0.40	-0.05	-1.19	-0.82
Office Paper	–	0.02	1.49	-0.18	-0.12	1.22
Phonebooks	–	0.02	0.40	-0.05	-1.19	-0.82
Textbooks	–	0.02	1.49	-0.18	-0.12	1.22
Mixed Paper (general)	–	0.02	0.93	-0.11	-0.72	0.13
Mixed Paper (primarily residential)	–	0.02	0.90	-0.10	-0.76	0.07
Mixed Paper (primarily from offices)	–	0.02	0.88	-0.10	-0.64	0.17

Note: The emission factors for landfill CH_4 presented in this table are based on national-average rates of landfill gas capture and energy recovery. Avoided CO_2 emissions from energy recovery are calculated based on the non-baseload GHG emissions intensity of U.S. electricity generation, since it is non-baseload power plants that will adjust to changes in the supply of electricity from energy recovery at landfills.
Negative values denote GHG emission reductions or carbon storage.
– = Zero emissions.

https://www.epa.gov/sites/production/files/2016-03/documents/warm_v14_containers_packaging_non-durable_goods_materials.pdf

Project Description Data

Polystyrene Use in San Diego	Units
4.4	pounds of polystyrene per person per year

Notes:
Based on halfway between the national average (1.8 to 7 lbs per person per year)
Source: The Resin Review 2012
The Resin Review, 2012 Edition
[1] For the purpose of this initial study, it is assumed that all polystyrene is EPS foam because there are no other reasonable polystyrene (rigid or film) data available. This is a conservative approach because the basis of the analysis is in part weight-based and EPS foam is generally lighter than rigid polystyrene. Although EPS foam is not necessarily lighter than EPS film, EPS film is likely not widely used by food service providers in the City. Instead, it would be more likely that polystyrene film would be found on pre-packaged food items.

Population of San Diego:	1,425,976

Source: Quick Facts. https://www.census.gov/quickfacts/fact/table/sandiegocitycalifornia/PST045218#PST045218. Accessed May 2020.

Pounds of Polystyrene Per Year	6,274,294

TABLE 1: POTENTIAL INCREASED PRODUCT WEIGHT ASSOCIATED WITH ORDINANCE

	Existing Conditions	Proposed Ordinance			
Material Type	Polystyrene	Paper	Plastic	Total	
Weight (lb)	6,270,000	0	15,675,000	15,675,000	
Net Change (lb)		9,405,000			4702.5

Per historical information from curbside recycling waste streams, it is estimated that paper materials (cardboard and mixed paper) make up approximatley 46% of the waste stream while plastics make up 3%. However, the analysis conservatively assumed the existing polystyrene use would be replaced by plastic products (heavier alternative than paper products).

Disposal Rates

6.4	pounds per person per year	Mountain View and Sunnyvale
6	pounds per person per year	New York City

Source:
Resource Recycling. 2017. The Rise of EPS Ordinances. https://resource-recycling.com/recycling/2017/02/06/rise-eps-ordinances/. Accessed May 2020.

March 2021 Recyling Waste Stream Information

Material Type	Percentage	Tons
Newspaper	25.90%	1338.47
Cardboard	15.16%	783.44
Mixed Paper	31.01%	1602.51
Aluminum Scrap	0.16%	8.09
Aluminum CRV	0.27%	14.12
Tin	1.04%	53.6
Flint Glass Scrap	0.36%	18.41
Flint Glass CRV	0.15%	7.53
Brown Glass Scrap	0.20%	10.46
Brown Glass CRV	0.07%	3.77
Green Glass Scrap	0.49%	25.13
Green Glass CRV	0.21%	10.97
Three Mix Glass Scrap	10.18%	525.96
Three Mix Glass CRV	2.08%	107.58
PET Scrap	0.94%	48.35
PET CRV	0.41%	21.25
HDPE Natural Scrap	0.54%	28.01
HDPE Natural CRV	0.02%	0.85
HDPE Color Scrap	0.78%	40.2
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Cartons	0.25%	12.96
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EPS	0.09%	4.87
Metal	0.44%	22.84
Contamination	23.87%	1233.49
Total Tons		**5951.63**

Source: Email communication Jennifer Ott-Rol and Justin Ono (City of San Diego 2021). May 13, 2021

Table 3.1-8

Net Increase in Annual Emissions Associated with Implementation of the Ordinance

Description	ROG	NO_x	CO	SO_x	PM_{10}	$PM_{2.5}$
	tons per year					
Proposed Ordinance: Delivery to Local Retailers Emissions	0.00	0.14	0.01	0.00	0.21	0.05
Proposed Ordinance: Disposal/Transportation to the Landfill	0.00	0.20	0.18	0.00	0.05	0.01
Total Emissions	0.01	0.35	0.20	0.00	0.26	0.07
Existing Emissions (Polystyrene)	0.00	0.14	0.08	0.00	0.10	0.03
Net Increase in Emissions	**0.00**	**0.21**	**0.12**	**0.00**	**0.16**	**0.04**
City of San Diego Thresholds	15	40	100	40	15	10
Exceeds Thresholds?	No	No	No	No	No	No

Table 3.1-9

Net Increase in Daily Emissions Associated with Implementation of the Ordinance

Description	ROG	NO_x	CO	SO_x	PM_{10}	$PM_{2.5}$
	tons per year					
Proposed Ordinance: Delivery to Local Retailers Emissions	0.02	1.11	0.09	0.01	1.65	0.42
Proposed Ordinance: Disposal/Transportation to the Landfill	0.01	1.29	1.19	0.00	0.30	0.08
Total Emissions	0.04	2.41	1.28	0.01	1.95	0.50
Existing Emissions (Polystyrene)	0.01	0.96	0.51	0.00	0.78	0.20
Net Increase in Emissions	**0.02**	**1.44**	**0.77**	**0.01**	**1.17**	**0.30**
City of San Diego Thresholds	137	250	550	250	100	67
Exceeds Thresholds?	No	No	No	No	No	No

Table 3.2-3

Net Increase in Emissions Associated with Implementation of the Ordinance

Description	GHG Emissions (MT CO_2e)
Proposed Ordinance: Delivery to Local Retailers	106
Proposed Ordinance: Disposal/Transport to the Landfill	69
Total Emissions	1831
Existing Emissions (Polystyrene)	70
Net Increase in Emissions	**1761**

Notes: MT CO_2e = metric tons carbon dioxide equivalent

Mobile Source Emissions Associated with Delivery to Local Retailers

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Annual Delivery Truck Round Trips	131
Annual Delivery One-Way Truck Trips	**261**

Annual	Paper (lbs)	Plastic (lbs)
Proposed Ordinance	0	15,675,000
Delivery Truck Round Trips	0	327
Total One-Way Truck Trips	**653**	

196

Annual Mobile Source Emission Estimates Associated with Delivery to Local Retailers						
tons per year						**MT per year**
ROG	**NOx**	**CO**	**SOx**	**PM10**	**PM2.5**	**CO2e**
Existing Polystyrene Delivery Emissions						
0.00	0.06	0.00	0.00	0.09	0.02	42.48
Proposed Ordinance Delivery Emissions						
0.00	0.14	0.01	0.00	0.21	0.05	106.19
Net Change						
0.00	**0.09**	**0.01**	**0.00**	**0.13**	**0.03**	**63.72**

Daily Mobile Source Emission Estimates Associated with Delivery to Local Retailers					
pounds per day					
ROG	**NOx**	**CO**	**SOx**	**PM10**	**PM2.5**
Existing Polystyrene Delivery Emissions					
0.01	0.44	0.04	0.00	0.66	0.17
Proposed Ordinance Delivery Emissions					
0.02	1.11	0.09	0.01	1.65	0.42
Net Change					
0.01	**0.67**	**0.06**	**0.00**	**0.99**	**0.25**

Emission Factors (grams/mile)							
Vehicle Type	ROG	NOx	CO	SOx	PM10	PM2.5	CO2e
T7 Single Unit Truck	0.043326426	2.157789331	0.181171467	0.0158917	3.2032406	0.816660107	1748.334646

Notes: Conservatively assumes 100% of delivery trucks are diesel-fueled.
PM emissions include travel on paved roads.

CO2	CH4	N2O
1678.211528	0.0020124	0.26440291

Average delivery to local retailers trip length (miles)	93
Estimated Weight Capacity per Delivery Truck (lbs)	48,000
Days of Transport per Year (5 days per week)	260

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CO2	1
N2O	265
CH4	28

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g	ton
907185	1
lbs	MT
2204.62	1
g	MT
1.00E+06	1
lbs	ton
2000	1

Sources:
https://afdc.energy.gov/data/10380

Vehicle Weight Classes & Categories

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Gross Vehicle Weight Rating (lbs)	Federal Highway Administration		US Census Bureau
	Vehicle Class	GVWR Catagory	VIUS Classes
<6,000	Class 1: <6,000 lbs	Light Duty <10,000 lbs	Light Duty <10,000 lbs
10,000	Class 2: 6,001 – 10,000lbs		
14,000	Class 3: 10,001 – 14,000 lbs	Medium Duty 10,001 – 26,000 lbs	Medium Duty 10,001 – 19,500 lbs
16,000	Class 4: 14,001 – 16,000 lbs		
19,500	Class 5: 16,001 – 19,500 lbs		
26,000	Class 6: 19,501 – 26,000 lbs		Light Heavy Duty: 19,001 – 26,000 lbs
33,000	Class 7: 26,001 – 33,000 lbs	Heavy Duty >26,001 lbs	Heavy Duty >26,001 lbs
>33,000	Class 8: >33,001 lbs		

Gross Vehicle Weight Rating (lbs)	EPA Emissions Classification			
	Heavy Duty Vehicle and Engines			Light Duty Vehicles
	H.D. Trucks	H.D. Engines	General Trucks	Passenger Vehicles
<6,000 6,000	Light Duty Truck 1 & 2 <6,000 lbs	Light Light Duty Trucks <6,000 lbs	Light Duty Trucks < 8500 lbs	Light Duty Vehicle < 8500 lbs
8,500	Light Duty Truck 3 & 4 6,001 – 8,500 lbs	Heavy Light Duty Trucks 6,001-8,500 lbs		
10,000	Heavy Duty Vehicle 2b 8,501 – 10,000 lbs	Light Heavy Duty Engines 8,501 lbs – 19,500 lbs	Heavy Duty Vehicle Heavy Duty Engine >8,500 lbs	Medium Duty Passenger Vehicle 8,501 – 10,000 lbs
14,000	Heavy Duty Vehicle 3 10,001 – 14,000 lbs			
16,000	Heavy Duty Vehicle 4 14,001 – 16,000 lbs			
19,500	Heavy Duty Vehicle 5 16,001 – 19,500 lbs			
26,000	Heavy Duty Vehicle 6 19,501 – 26,000 lbs	Medium Heavy Duty Engines 19,501 – 33,000 lbs		
33,000	Heavy Duty Vehicle 7 26,001 – 33,000 lbs			
60,000	Heavy Duty Vehicle 8a 33,001 – 60,000 lbs	Heavy Heavy Duty Engines Urban Bus >33,001		
>60,000	Heavy Duty Vehicle 8b >60,001			

These charts illustrate the vehicle weight classes and categories used by the Federal Highway Administration (FHWA), the U.S. Census Bureau, and the U.S. Environmental Protection Agency (EPA). The vehicle weight classes are defined by FHWA and are used consistently throughout the industry. These classes, 1-8, are based on gross vehicle weight rating (GVWR), the maximum weight of the vehicle, as specified by the manufacturer. GVWR includes total vehicle weight plus fluids, passengers, and cargo. FHWA categorizes vehicles as Light Duty (Class 1-2), Medium Duty (Class 3-6), and Heavy Duty (Class 7-8). EPA defines vehicle categories, also by GVWR, for the purposes of emissions and fuel economy certification. EPA classifies vehicles as Light Duty (GVWR < 8,500 lb) or Heavy Duty (GVWR > 8,501 lb). Within the Heavy-Duty class, there is a Medium Heavy Duty Diesel Engine class for engine-only certification, but no Medium-Duty Vehicle class. The September 2011 U.S. Department of Transportation (DOT)/EPA rulemaking on Greenhouse Gas Emissions Standards and Fuel Efficiency Standards for Medium- and Heavy-Duty Engines and Vehicles uses categories and weights for Heavy-Duty Vehicle Classes 2b through 8, similar to the FHWA weight classes.

Encinitas, California

Mountain Empire Unified, California

Add destination

Leave now OPTIONS

Send directions to your phone

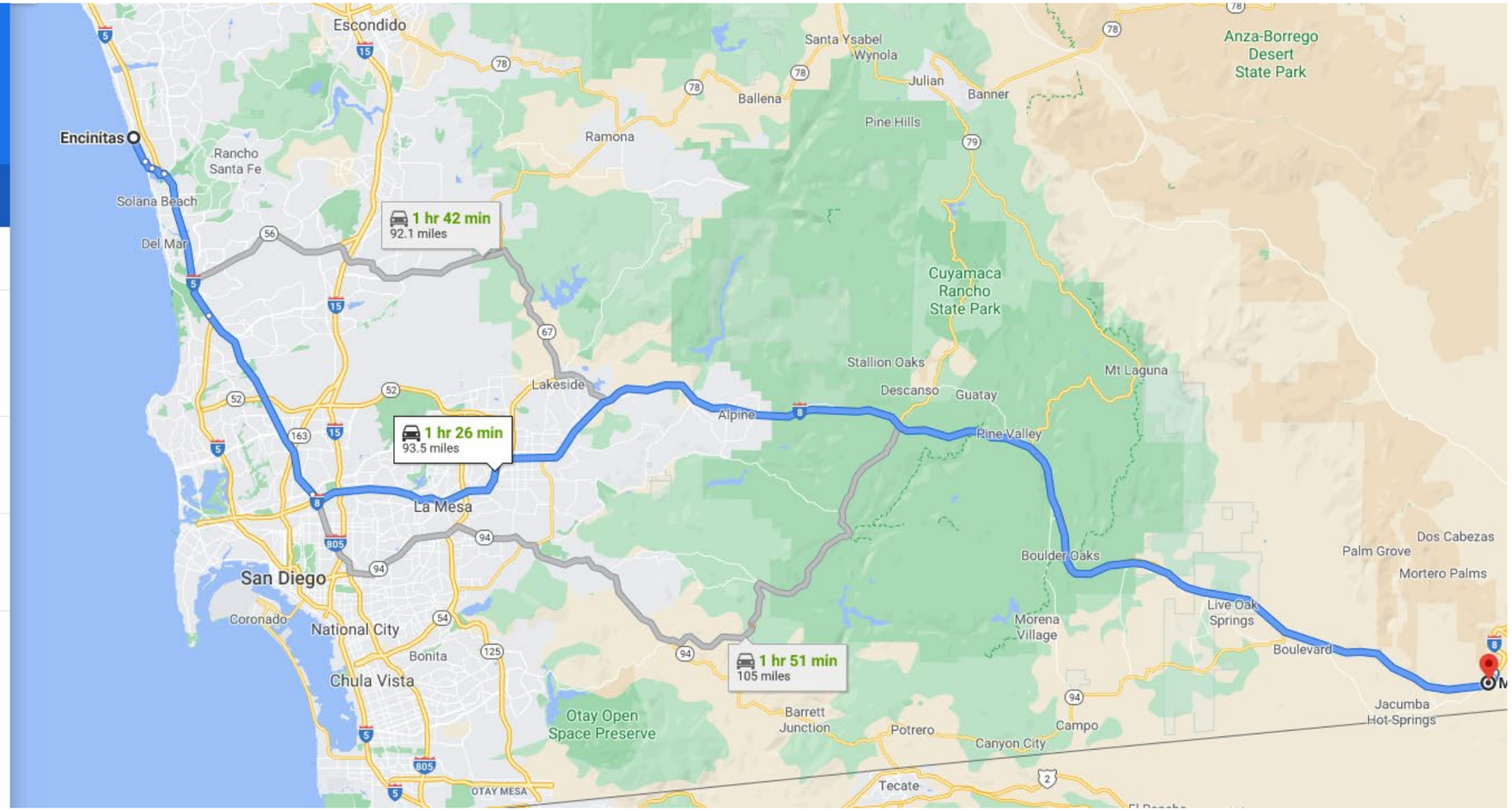
via I-8 E — 1 hr 26 min
Fastest route, the usual traffic — 93.5 miles
DETAILS

via CA-67 S and I-8 E — 1 hr 42 min
92.1 miles

via CA-94 E and I-8 E — 1 hr 51 min
105 miles

Explore Mountain Empire Unified

Restaurants Hotels Gas stations Parking Lots More



Mobile Source Emissions Associated with Disposal to Landfill

Annual Existing Polystyrene Weight (lbs)	**6,270,000**
Annual Round Trips	224
Annual Truck Trips	**448**

Annual	Paper (lbs)	Plastic (lbs)
Proposed Ordinance	0	15,675,000
Truck Round Trips	0	560
Total One-Way Truck Trips	**1120**	

Annual Mobile Source Emission Estimates Associated with Disposal to Landfill/Recycling Center						
tons per year						**MT per year**
ROG	**NOx**	**CO**	**SOx**	**PM10**	**PM2.5**	**CO2e**
Existing Polystyrene Delivery Emissions						
0.00	0.08	0.07	0.00	0.02	0.00	27.74
Proposed Ordinance Delivery Emissions						
0.00	0.20	0.18	0.00	0.05	0.01	69.35
Net Change						
0.00	**0.12**	**0.11**	**0.00**	**0.03**	**0.01**	**41.61**

Daily Mobile Source Emission Estimates Associated with Disposal to Landfill/Recycling Center					
pounds per day					
ROG	**NOx**	**CO**	**SOx**	**PM10**	**PM2.5**
Existing Polystyrene Delivery Emissions					
0.01	0.52	0.47	0.00	0.12	0.03
Proposed Ordinance Delivery Emissions					
0.01	1.29	1.19	0.00	0.30	0.08
Net Change					
0.01	**0.78**	**0.71**	**0.00**	**0.18**	**0.05**

Emission Factors (grams/mile)							
Vehicle Type	ROG	NOx	CO	SOx	PM10	PM2.5	CO2e
T7 SWCV	0.097914529	8.665973861	7.939434251	0.022032394	2.0192555	0.525474042	3282.813492

Notes: Assumes solid waste collection vehicles are 55% diesel fueled and 45% natural gas powered per EMFAC2021 data for San Diego County in 2021.
PM emissions include travel on paved roads.

CO2	CH4	N2O
3096.26036	1.708505432	0.523452755

Assumed trip length (miles)	18.87
Estimated Weight Capacity per SWCV (lbs)	28,000
Days of Transport per Year (6 days per week)	312

Notes: Assumes that all containers are disposed at a landfill/recycling center.

Distance between City and Landfill (miles)		**% of Material Disposed at Facility**
Miramar Landfill	15.6	53%
Otay Landfill	24.7	31%
Sycamore Landfill	18.4	16%

Distance between City and Recycling Center (miles)	
EDCO Recyling	7.0
Allan Company	17.2
IMS Recycling Services, Inc.	4.0

Source: https://www.sandiego.gov/sites/default/files/legacy/environmental-services/geninfo/pdf/draftnondisfacelement.pdf

Trip distance based on the weighted average trip distance between City of San Diego and Miramar Landfill, Otay Landfill, and Sycamore Landfill (which is more conservative than the distance between City of San Diego and recycling centers).
https://www.sandiego.gov/sites/default/files/legacy/environmental-services/pdf/wastemanagementhistory.pdf
Weight capacity of SWCV based on 14 tons of waste per https://scdhec.gov/environment/land-and-waste-landfills/how-landfills-work

The County developed a network of landfills, which, by 1990, included a large landfill in the northern part of the County (San Marcos), one in the east (Sycamore, located in the City of San Diego, adjacent to Santee), and another in the south (Otay, located with the City of Chula Vista on land that is unincorporated). This network, together with the City's Miramar Landfill in the center of the City of San Diego's population, allowed relatively short collection routes. Based on CalRecycle 2020 Jurisdiction Disposal and Beneficial Reuse by Destination data, these landfills are the destination facility for 93% of the material.

GWP Values	
CO2	1
N2O	265
CH4	28

Conversion Factors	
g	ton
907185	1
lbs	MT
2204.62	1
g	MT
1.00E+06	1
lbs	ton
2000	1

Sources:
https://afdc.energy.gov/data/10380

Indirect GHG Emissions from Disposal at Landfill

Annual Existing Polystyrene Weight (lbs)		**6,270,000**
Annual	Paper (lbs)	Plastic (lbs)
Proposed Ordinance	15,048,000	15,675,000

Note: Analysis conservatively assume replacement products are 100% paper.

Landfilling Emission Factors for Paper Products (MT CO2e/Short Ton)

Material	**Landfill CH4**	**Avoided CO2 Emissions from Energy Recorvery**	**Landfill Carbon Storage**	**Net Emissions (Post-Consumer)**
Corrugated Containers	1.05	-0.11	-0.72	0.22

Notes: Emission Factors from EPA GHG Emission Factors used in the WARM tool (February 2016) Exhibit 3-26
Does not include transportation to landfill as those emissions are calculated in Mobile-Disposal tab using emission factors specific to San Diego County

WARM calculates emission factors for each of these three landfill types and uses the national average mix of collection systems installed at landfills in the United States to calculate a national average emission factor that accounts for the extent to which CH4 is not captured, is flared without energy recovery, or is combusted onsite for energy recovery.

Because plastics do not contain biodegradable carbon, they do not generate CH4 and are not considered to store any carbon when landfilled. The only emissions associated with landfilling plastics are from transportation to the landfill and moving waste in the landfill (calculated in Mobile-Disposal tab).

Proposed Ordinance	Annual Disposal (tons)	GHG Emissions (MT CO2e)*
Paper	7524	**1,655**

*Total emissions associated with landfilling and degradation of paper products

Conversion Factors	
kg to pounds	2.20462
g per pound	453.592
tons to metric tons	0.907185
pounds per ton	2000
pounds per metric ton	2204.62262
months per year	12
days per year	365
Global Warming Potential	
CO2	1
Ch4	28
N20	265

Exhibit 3-26: Landfilling Emission Factors for Paper Products ($MTCO_2E$/Short Ton)

Material	Raw Material Acquisition and Manufacturing (Current Mix of Inputs)	Transportation to Landfill	Landfill CH_4	Avoided CO_2 Emissions from Energy Recovery	Landfill Carbon Storage	Net Emissions (Post-Consumer)
Corrugated Containers	–	0.02	1.05	-0.11	-0.72	0.23
Magazines/Third-Class Mail	–	0.02	0.48	-0.05	-0.85	-0.39
Newspaper	–	0.02	0.40	-0.05	-1.19	-0.82
Office Paper	–	0.02	1.49	-0.18	-0.12	1.22
Phonebooks	–	0.02	0.40	-0.05	-1.19	-0.82
Textbooks	–	0.02	1.49	-0.18	-0.12	1.22
Mixed Paper (general)	–	0.02	0.93	-0.11	-0.72	0.13
Mixed Paper (primarily residential)	–	0.02	0.90	-0.10	-0.76	0.07
Mixed Paper (primarily from offices)	–	0.02	0.88	-0.10	-0.64	0.17

Note: The emission factors for landfill CH_4 presented in this table are based on national-average rates of landfill gas capture and energy recovery. Avoided CO_2 emissions from energy recovery are calculated based on the non-baseload GHG emissions intensity of U.S. electricity generation, since it is non-baseload power plants that will adjust to changes in the supply of electricity from energy recovery at landfills. Negative values denote GHG emission reductions or carbon storage.
– = Zero emissions.

https://www.epa.gov/sites/production/files/2016-03/documents/warm_v14_containers_packaging_non-durable_goods_materials.pdf

Source: EMFAC2021 (v1.0.1) Emission Rates
Region Type: County
Region: San Diego
Calendar Year: 2021
Season: Annual
Vehicle Classification: EMFAC202x Categories
Units: miles/year for CVMT and EVMT, trips/day for Trips, kWh/day for Energy Consumption, g/mile for RUNEX, PMBW and PMTW, g/trip for STREX, HOTSOAK and RUNLOSS, g/vehicle/day for IDLEX and DIURN

Region	Calendar Year	Vehicle Category	Model Year	Speed	Fuel	Population		VMT	Trips	NOx_RUNEX	PM2.5_RUNEX	PM2.5_PMTW	PM2.5_PMBW	PM10_RUNEX	PM10_PMTW	PM10_PMBW	CO2_RUNEX	CH4_RUNEX	N2O_RUNEX	ROG_RUNEX	CO_RUNEX	SOx_RUNEX
San Diego	2021	T7 Single Other Class 8	Aggregate	Aggregate	Diesel	1466.443924		87978.514	13813.9	2.157789331	0.028991488	0.009000003	0.029102233	0.030302354	0.03600001	0.083149237	1678.211528	0.0020124	0.26440291	0.043326426	0.181171467	0.01589166
San Diego	2021	T7 SWCV Class 8	Aggregate	Aggregate	Diesel	729.9374923	0.55	47399.767	3357.712	12.87937665	0.015015057	0.009000003	0.073500021	0.015693972	0.03600001	0.21000006	4242.658305	0.000869827	0.668432544	0.018727144	0.056384319	0.040175437
San Diego	2021	T7 SWCV Class 8	Aggregate	Aggregate	Natural Ga	605.5471329	0.45	39032.344	2785.517	3.549337455	0.00482913	0.009000003	0.073500021	0.005252119	0.03600001	0.21000006	1704.10733	3.782209502	0.347393427	0.194077436	17.51238569	0
Emission Factor for Solid Waste Collection Vehicles								**86,432.11**		**8.66597**	**0.01042**	**0.00900**	**0.07350**	**0.01098**	**0.03600**	**0.21000**	**3096.26036**	**1.70851**	**0.52345**	**0.09791**	**7.93943**	**0.02203**

Paved Road Dust $EF_{DUST} = [(k(sL)^{0.91} \times (W)^{1.02}](1 - P/4N))$

Source: AP-42 Section 13.2.1 (Paved Roads) - http://www.epa.gov/ttnchie1/ap42/ch13/final/c13s0201.pdf

Variable	Value	Description
k (PM10)	0.0022	particle size multiplier for particle size rangeand units of interest (lb/VMT)
k (PM2.5)	0.00054	particle size multiplier for particle size rangeand units of interest (lb/VMT)
sL	0.1	road surface silt loading (g/m^2)
W	24	delivery truck weight (tons)
W	14	SWCV weight (tons)
P	40	number of "wet" days with at least 0.254 mm (0.1 inches) of precipitation during the averaging period (San Diego County)
N	365	number of days in averaging period
Delivery Truck		
EF (PM10)	3.053788971	g/VMT
EF (PM2.5)	0.749566384	g/VMT
Solid Waste Collection Truck		
EF (PM10)	1.762276915	g/VMT
EF (PM2.5)	0.432558879	g/VMT

Conversion Factors	
g	lbs
453.592	1