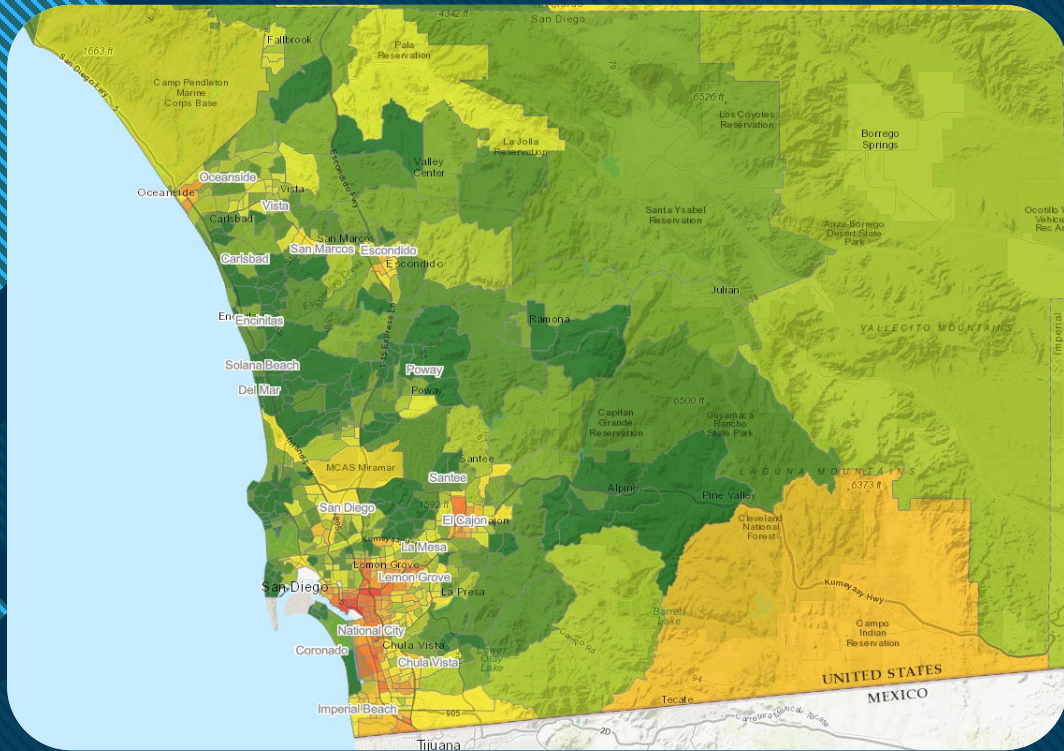


SD County Indirect Source Rule?

Seeking to Understand How Warehouses Affect Mobile Source Air Pollution in San Diego- Past, Present, and Future



Introduction

Assembly Bill 423

- Orders APCD to consider adopting an Indirect Source Rule
- Target: Stationary Sources that attract Mobile Sources of air pollutants (DPM and NOx)
 - Ports, Warehouses, and Distribution Centers

Presumption:

Warehouses are major contributors to mobile source pollution in SD County

Bottom Line Up-Front:

- Truck volumes in SD County areas w/ warehouses do not appear to be higher than other high traffic/DPM affected areas in SD County
- Models show steady “floor” for overall PM 2.5 emissions as electric transition continues
- El Cajon/Escondido to benefit most from electrification (NOx and ozone reductions)



Many Models and Data Sources

- New geospatial models and datasets help to facilitate meta-analyses
- Known datasets for
 - Traffic model volumes
 - Vehicle traffic types
 - Emissions modeling
- CARB, CALTRANS, OEHHA, City of San Diego



Analysis Problem Statement:

Can a connection be observed between warehouses, truck volume, and DPM in San Diego Census Tracts?

Follow-up Question:

Would additional regulation on warehouse facilities provide a material improvement to emissions in Disadvantaged Communities?



Analysis Data Sources

- CalEnviroScreen 4.0
 - <https://oehha.ca.gov/media/downloads/calenviroscreen/document/calenviroscreen40resultsdatadictionaryf2021.zip>
- Annual Average Daily Truck Traffic (AADT) , 2016, 2021, and 2022 CalTrans
 - https://dot.ca.gov/-/media/dot-media/programs/traffic-operations/documents/census/aadt/2016_truck_aadt_xlsx.xlsx
 - <https://dot.ca.gov/-/media/dot-media/programs/traffic-operations/documents/census/2021/2021-truck-aadt-ca.xlsx>
 - <https://dot.ca.gov/-/media/dot-media/programs/traffic-operations/documents/census/2022/2022-truck-aadt.xlsx>
- California Air Resources Board Emission Factor (EMFAC 2021) Model
 - EMFAC (ca.gov)
- California Air Resources Board California Emissions Projection Analysis Model (CEPAM)
 - CEPAM2019v1.03 - Standard Emission Tool | California Air Resources Board
- Google Earth, October 2023
 - Informed by native San Diegan
 - Lives in Chula Vista
 - Worked in Kearney Mesa, Oceanside, Miramar, Poway, National City, and Otay Mesa

Methodology

1) Reviewed CalEnviroScreen Census Tract Data

- Census tracts include ZIP Code, Lat/Long, and Approximate Location
- Filtered for San Diego County Locations
- Viewed points on Maps, added neighborhoods for context
 - Example: Census Tract 6073005000 is listed as San Diego, but refined to Portside San Diego
- Calculated Average DPM and Traffic % Score by Refined Location

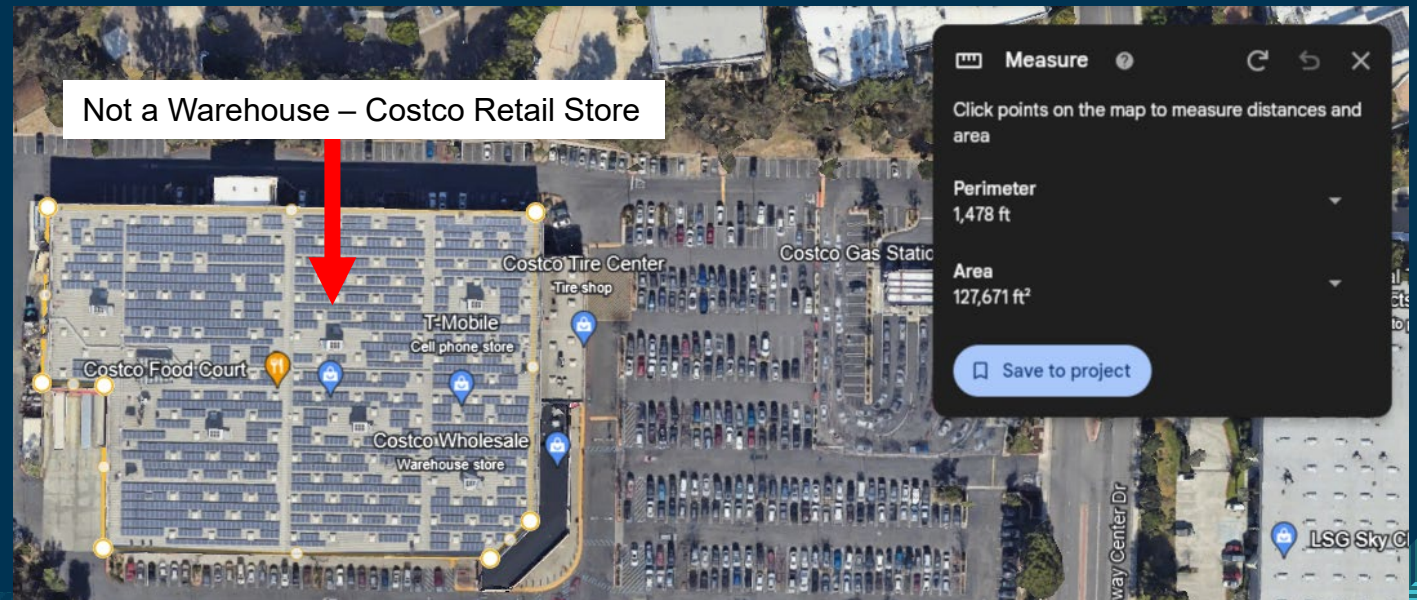
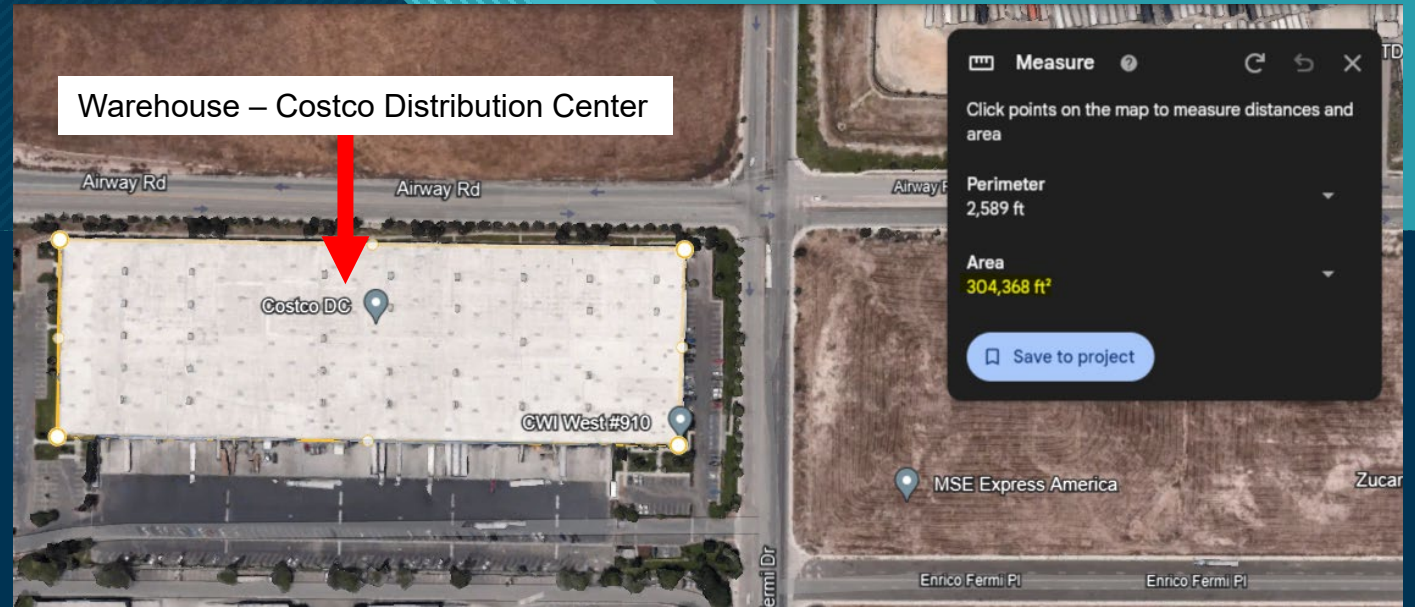
Census Tract	Total Population	California County	ZIP	Approximate Location	Refined Location	Longitude	Latitude	Ozone	Ozone Pctl	PM2.5	PM2.5 Pctl	Diesel PM	Diesel PM Pctl	Traffic	Traffic Pctl
6073005400	7888	San Diego	92101	San Diego	Downtown San Diego	-117.167	32.71194	0.043	29.89	10.40908	51.80	3.017	99.98	397.9312	13.9875
6073011000	3567	San Diego	92118	Coronado	Coronado	-117.17	32.69388	0.043	29.89	10.40904	51.77	2.606	99.94	1722.125	82.4125
6073005300	5847	San Diego	92101	San Diego	Downtown San Diego	-117.162	32.71568	0.043	29.89	10.22066	50.55	1.389	99.29	442.5093	16.8375
6073005200	7087	San Diego	92101	San Diego	Downtown San Diego	-117.152	32.71553	0.043	29.89	10.39554	51.70	1.297	99.08	878.3711	49.8125
6073005000	2195	San Diego	92113	San Diego	Portside San Diego	-117.141	32.69485	0.043	29.89	10.38171	51.64	1.202	98.94	672.1474	33.9375
6073005700	1590	San Diego	92101	San Diego	Downtown San Diego	-117.163	32.72528	0.043	29.89	10.20922	50.47	1.126	98.73	729.8221	38.65
6073005800	3953	San Diego	92101	San Diego	Downtown San Diego	-117.171	32.7249	0.043	29.89	10.40908	51.80	1.045	98.39	908.1276	52.1625
6073004700	1703	San Diego	92102	San Diego	Portside San Diego	-117.145	32.70839	0.043	29.89	10.19696	50.38	1.006	98.27	1047.224	61
6073004600	2004	San Diego	92102	San Diego	San Diego (Inland)	-117.145	32.71519	0.043	29.89	10.19696	50.38	1.003	98.25	1174.404	67.6625
6073005100	7702	San Diego	92113	San Diego	Portside San Diego	-117.153	32.70374	0.043	29.89	10.42174	51.91	0.959	97.92	681.3372	34.625
6073005600	4587	San Diego	92101	San Diego	Downtown San Diego	-117.147	32.73039	0.043	29.89	9.967784	48.82	0.914	97.65	802.0453	44.4625
6073006100	2370	San Diego	92103	San Diego	Downtown San Diego	-117.174	32.73642	0.043	29.89	10.29365	51.06	0.840	97.08	1301.794	72.325
6073009201	5745	San Diego	92123	San Diego	Kearney Mesa	-117.146	32.80154	0.044	37.57	9.22904	40.92	0.812	96.83	1880.536	85.25
6073008361	2634	San Diego	92037	San Diego	La Jolla	-117.234	32.868	0.045	39.99	9.585448	45.29	0.808	96.80	1294.818	72.1125
6073008702	5320	San Diego	92123	San Diego	Mission Valley	-117.156	32.78836	0.044	37.57	9.446848	43.91	0.785	96.61	2313.314	90.7625
6073001100	3168	San Diego	92116	San Diego	San Diego (Inland)	-117.133	32.7653	0.044	35.16	9.720601	46.38	0.780	96.53	1656.667	81.175
6073000700	4624	San Diego	92103	San Diego	San Diego (Hillcrest/North Park)	-117.151	32.74476	0.043	29.89	9.955846	48.71	0.735	95.96	813.0198	45.1625
6073004501	2505	San Diego	92102	San Diego	San Diego (Inland)	-117.138	32.71763	0.043	29.89	10.2257	50.60	0.719	95.79	222.8683	4.9125
6073000400	3801	San Diego	92103	San Diego	San Diego (Hillcrest/North Park)	-117.163	32.75333	0.043	32.15	9.930702	48.39	0.705	95.47	1010.782	58.6125
6073000600	3207	San Diego	92103	San Diego	San Diego (Hillcrest/North Park)	-117.152	32.753	0.043	32.15	9.8113	47.21	0.697	95.31	987.1044	57.075
6073003305	6601	San Diego	92113	San Diego	National City	-117.09	32.69789	0.043	29.89	10.41411	51.86	0.685	95.05	2186.128	89.6625
6073008902	2231	San Diego	92108	San Diego	Mission Valley	-117.18	32.76356	0.043	32.15	9.808224	47.17	0.682	95.00	1483.239	77.7875
6073001600	5821	San Diego	92104	San Diego	San Diego (Hillcrest/North Park)	-117.121	32.75216	0.044	35.16	9.953875	48.67	0.677	94.91	1148.1	66.3125
6073003404	5062	San Diego	92102	San Diego	San Diego (Inland)	-117.094	32.71396	0.043	29.89	10.32683	51.26	0.658	94.72	2158.705	89.2125
6073005900	3344	San Diego	92101	San Diego	Downtown San Diego	-117.164	32.72934	0.043	29.89	10.20922	50.47	0.658	94.70	882.1596	50.1625
6073004100	7307	San Diego	92102	San Diego	San Diego (Inland)	-117.129	32.71483	0.043	29.89	10.23492	50.67	0.652	94.44	985.7713	57.025
6073004900	5505	San Diego	92113	San Diego	Portside San Diego	-117.139	32.70185	0.043	29.89	10.32176	51.24	0.651	94.42	537.2402	23.7375
6073008340	9762	San Diego	92122	San Diego	University City	-117.204	32.86808	0.045	42.56	9.43362	43.75	0.633	93.99	1550.422	79.1
6073003800	6372	San Diego	92136	San Diego	Portside San Diego	-117.121	32.68353	0.042	26.70	10.35821	51.50	0.626	93.78	726.9515	38.3875
6073002401	4791	San Diego	92104	San Diego	San Diego (Hillcrest/North Park)	-117.115	32.74707	0.044	35.16	10.01012	49.28	0.619	93.43	1628.182	80.7125
6073003902	4388	San Diego	92113	San Diego	Portside San Diego	-117.126	32.69675	0.043	29.89	10.28523	50.99	0.615	93.28	962.412	55.7625
6073002501	5406	San Diego	92105	San Diego	San Diego (Hillcrest/North Park)	-117.11	32.74004	0.043	32.15	10.01483	49.33	0.610	93.20	4767.791	99.525
6073013306	4517	San Diego	91911	Chula Vista	Chula Vista	-117.04	32.60366	0.043	29.89	11.73723	67.48	0.604	93.08	1870.379	85.1125

NOTE: DPM and Traffic data in CES 4.0 are from 2016....

Methodology

2) Identified Warehouse Spaces in San Diego County

- Aerial review on Google Earth
 - 2016 Aerial Imagery
 - Current (October 2023)
- Facilities identified as defined in SCAQMD Rule 2305
 - “A building that stores cargo, goods, or products on a short- or long-term basis for later distribution for businesses and/or retail customers.”
- Measure Property Area in SF
 - Acknowledge that not all area is warehouse space
- Track Facility Name, Total Area, and Location in SD County
- 300+ Facilities identified
 - Acknowledge that dataset is not exhaustive, but representative

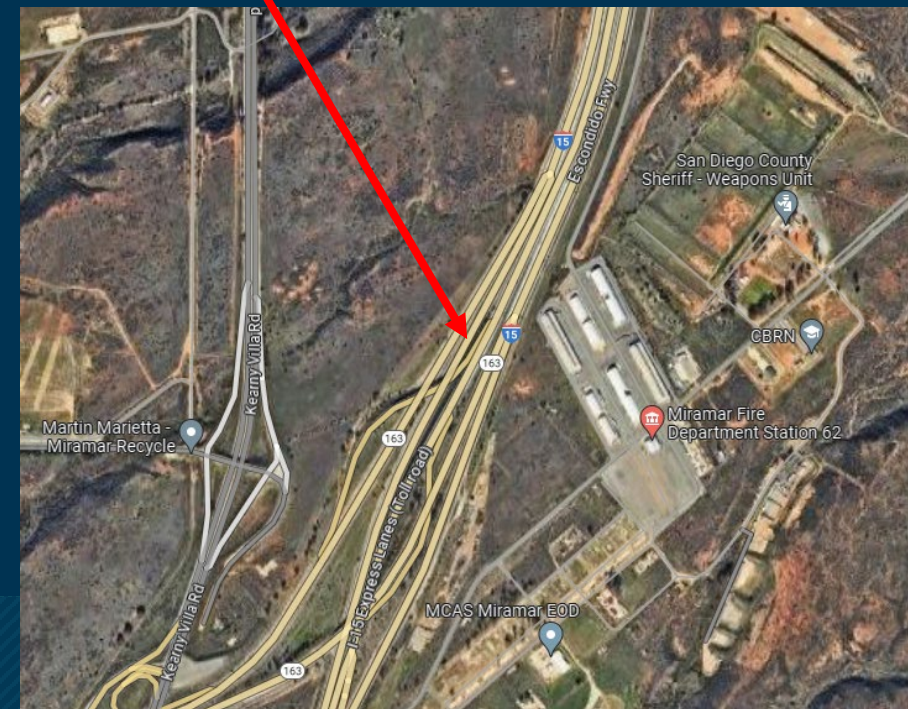


Methodology

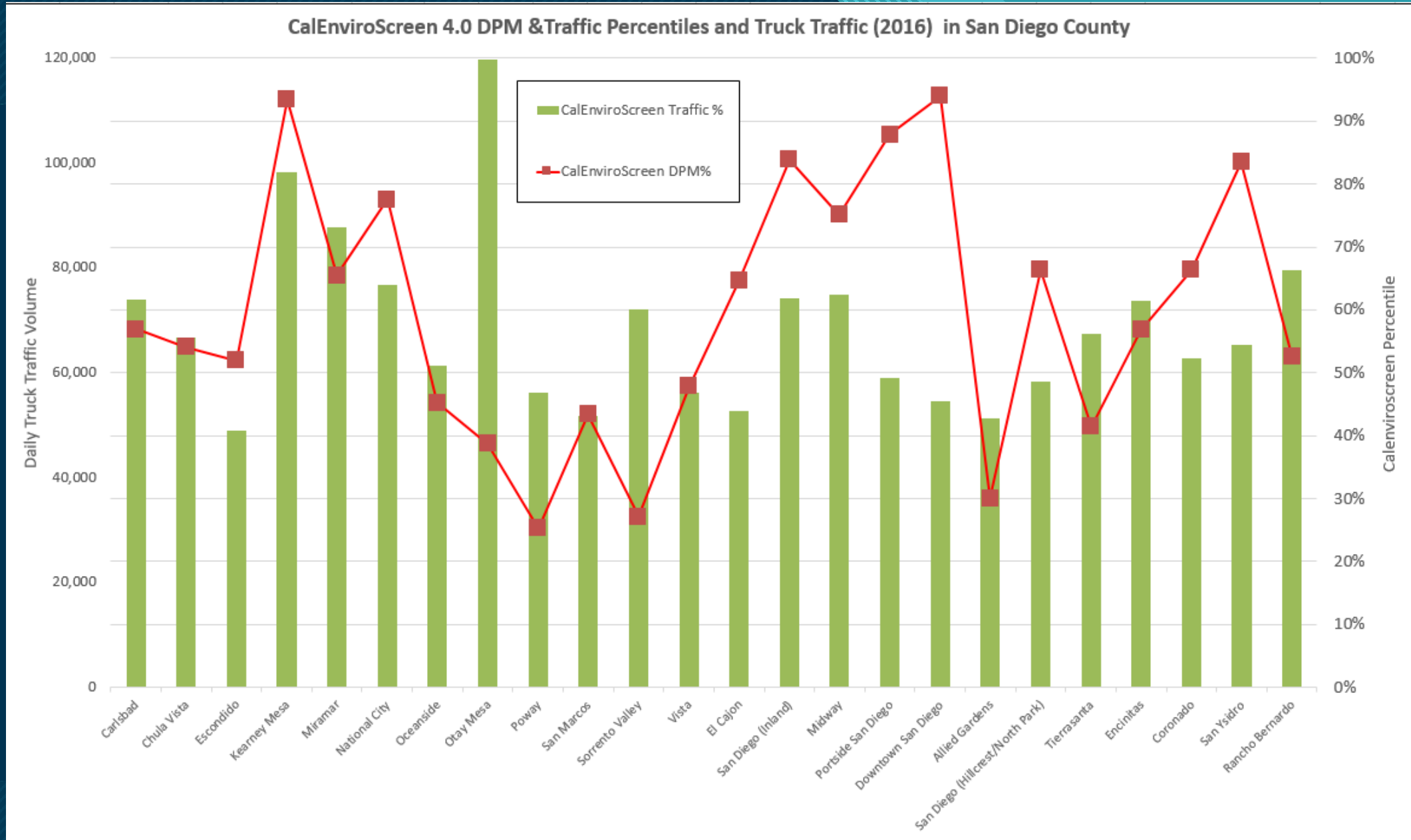
3) Reviewed CalTrans Annual Average Daily Truck Volumes

- For each major freeway junction
 - Total Vehicles on road
 - 2, 3, 4, 5 axle Trucks
 - Personal Vehicles
- Assigned “Refined Location” to list of junctions
- Matched CalEnviroScreen 4.0 and CalTrans datasets
- Limitation: Data not available for all exits/junctions – major arteries and crossings**

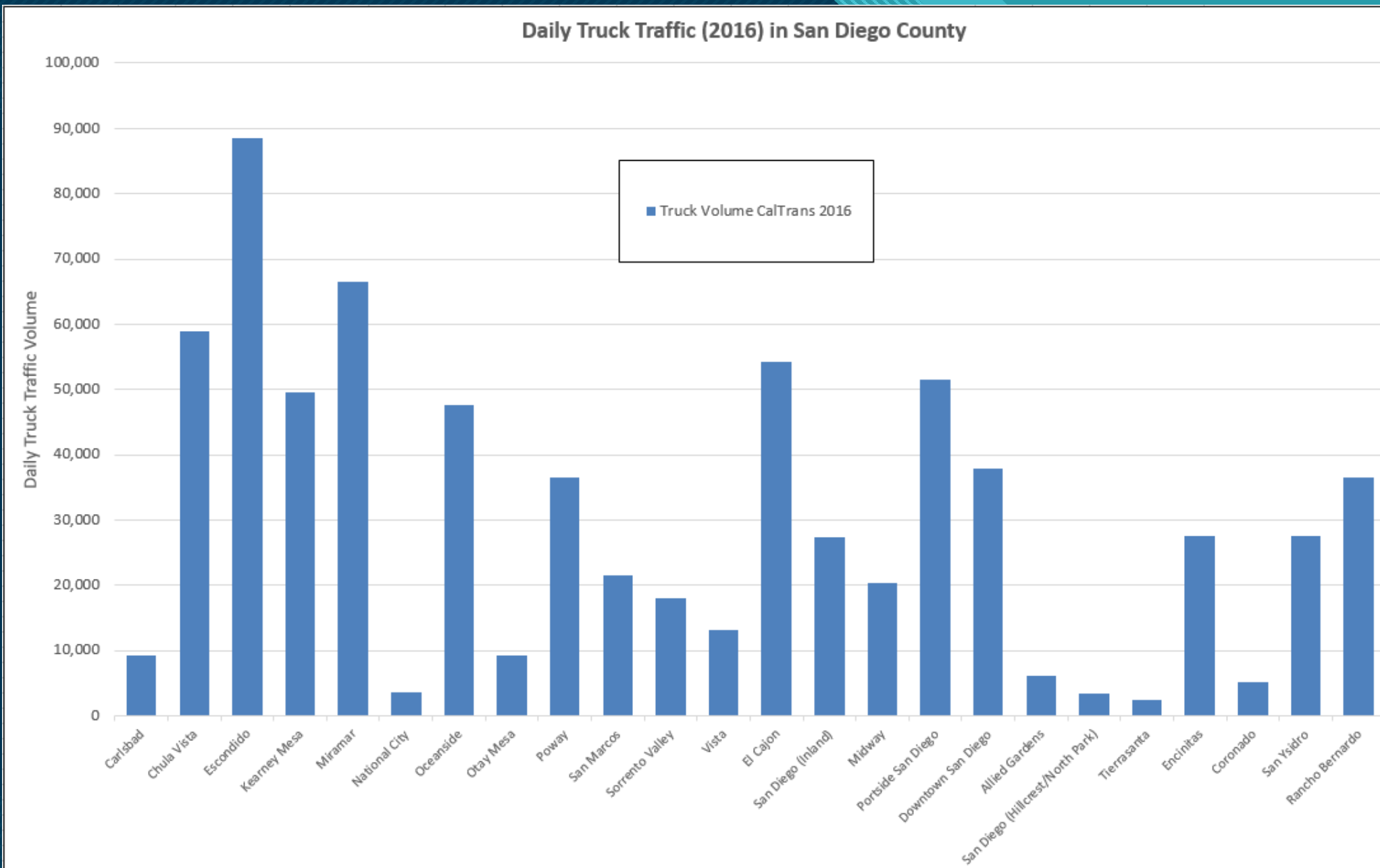
RTE	RTE_SFX	DIST	CNTY	PM_PFX	POSTMILE	PM_SFX	LEG	DESCRIPTION	VEHICLE_AADT_TOTAL	TOT_TRK_AADT	CAR_AADT TOTAL	TRK_PERCENT_TOT	TRK_2_AXLE	TRK_2_AXLE_PCT	TRK_3_AXLE	TRK_3_AXLE_PCT	TRK_4_AXLE	TRK_4_AXLE_PCT	TRK_5_AXLE	TRK_5_AXLE_PCT	EAL	EST_YEAR	EST_CODE
015	11	SD	M		12.124	A		JCT. RTE. 163	259000	9661	249339	3.73	5936	61.44	696	7.20	267	2.76	2763	28.60	1,264	7	E
015	11	SD	M		14.285	B		SAN DIEGO, MIRAMAR/ POMERADO ROADS	257000	9663	247337	3.76	5937	61.44	696	7.20	267	2.76	2764	28.60	1,265	7	E
015	11	SD	R		31.517	B		JCT. RTE. 78	252000	17892	234108	7.10	8731	48.80	2022	11.30	1002	5.60	6137	34.30	2,756	96	E
805	11	SD	B		8.854	B		JCT. RTE. 54, SWEETWATER ROAD	243000	14580	228420	6.00	7417	50.87	1292	8.86	378	2.59	5494	37.68	2,329	4	V
015	11	SD	M		14.285	A		SAN DIEGO, MIRAMAR/ POMERADO ROADS	242000	9438	232562	3.90	5531	58.60	991	10.50	368	3.90	2548	27.00	1,218	85	V
008	11	SD	A		5.638	A		JCT. RTE. 15	238000	8330	229670	3.50	5331	64.00	958	11.50	375	4.50	1666	20.00	905	84	E
805	11	SD	B		14.641	B		SAN DIEGO, JCT. RTE. 15	227000	13620	213380	6.00	6928	50.87	1207	8.86	353	2.59	5132	37.68	2,176	4	E
015	11	SD	M		18.176	B		SAN DIEGO, POWAY ROAD	224000	15904	208096	7.10	7761	48.80	1797	11.30	891	5.60	5455	34.30	2,450	96	E
008	11	SD	B		5.638	B		JCT. RTE. 15	212000	6360	205640	3.00	3721	58.50	808	12.70	267	4.20	1565	24.60	784	83	V
805	11	SD	X		24.440	X		GOVERNOR DRIVE INTERCHANGE	210100	11619	198481	5.53	6336	54.53	898	7.73	356	3.06	4029	34.68	1,747	21	V
015	11	SD	R		6.132	A		JCT. RTE. 8	206000	10259	195741	4.98	6406	62.44	734	7.15	241	2.35	2878	28.05	1,320	7	V
005	11	SD	R		0.878	A		SOUTH JCT. RTE. 805	33500	1273	32227	3.80	670	52.60	163	12.80	13	1.00	428	33.60	188	83	V
008	11	SD	A		15.800	A		EL CAJON, JCT. RTE. 67 NORTH	202000	5858	196142	2.90	3245	55.40	662	11.30	205	3.50	1746	29.80	807	78	V
805	11	SD	B		17.645	B		JCT. RTE. 8	202000	13130	188870	6.50	7401	56.37	1217	9.27	456	3.47	4056	30.89	1,837	4	E
005	11	SD	A		4.632	A		JCT. RTE. 75 WEST	136000	5032	130968	3.70	2828	56.20	815	16.20	242	4.80	1147	22.80	605	83	V
005	11	SD	B		4.632	B		JCT. RTE. 75 WEST	106000	4452	101548	4.20	2858	64.20	539	12.10	134	3.00	922	20.70	487	78	V
805	11	SD	O		5.542	O		NAPLE STREET UNDERCROSSING	198000	7088	190912	3.58	2727	38.47	573	8.08	208	2.93	3580	50.51	1,414	21	V
805	11	SD	B		6.059	B		TELEGRAPH CANYON ROAD	198000	14494	183506	7.32	7373	50.87	1284	8.86	375	2.59	5461	37.68	2,315	4	V



CalEnviroScreen 4.0 - DPM and Traffic

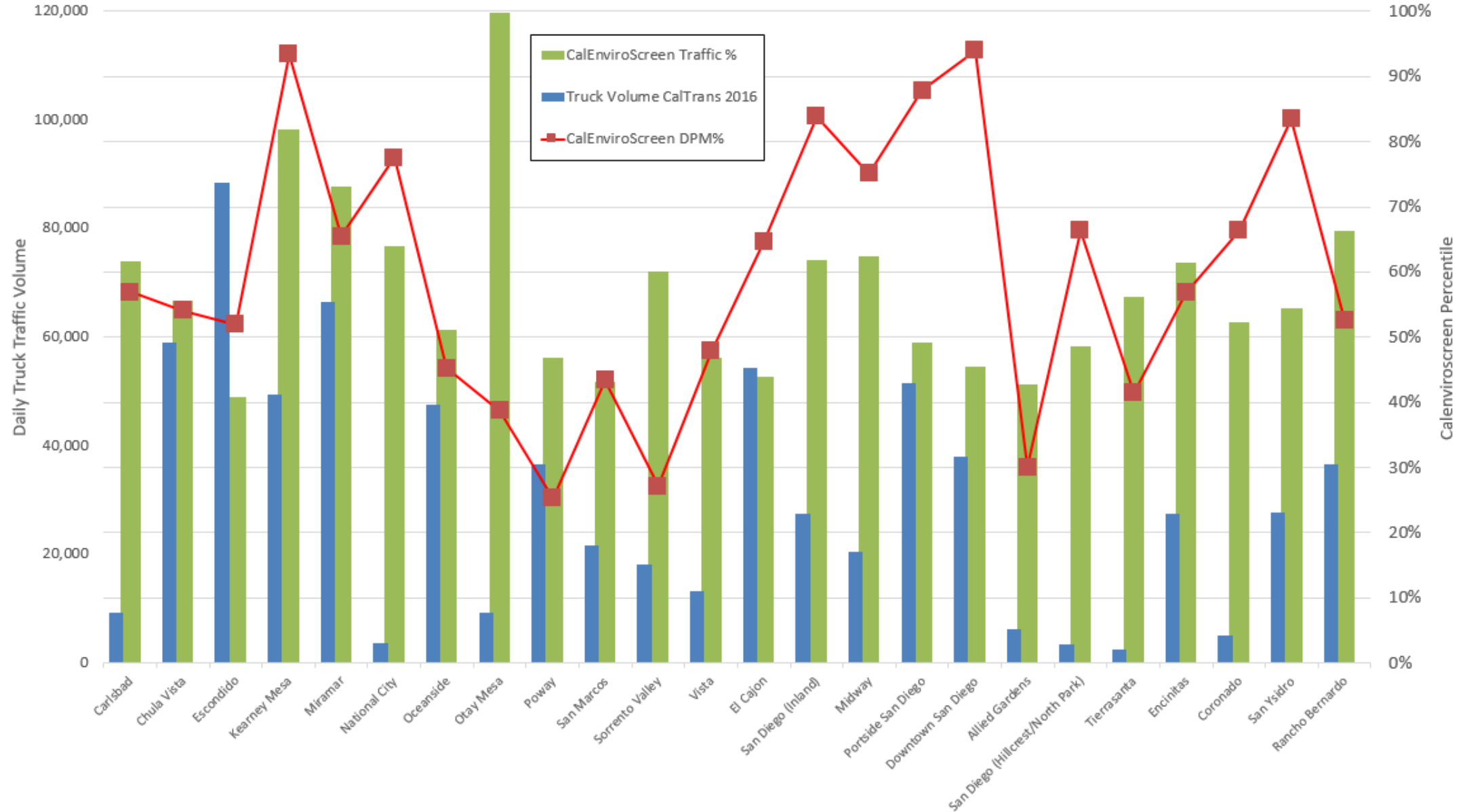


Daily Truck Trips in SD County

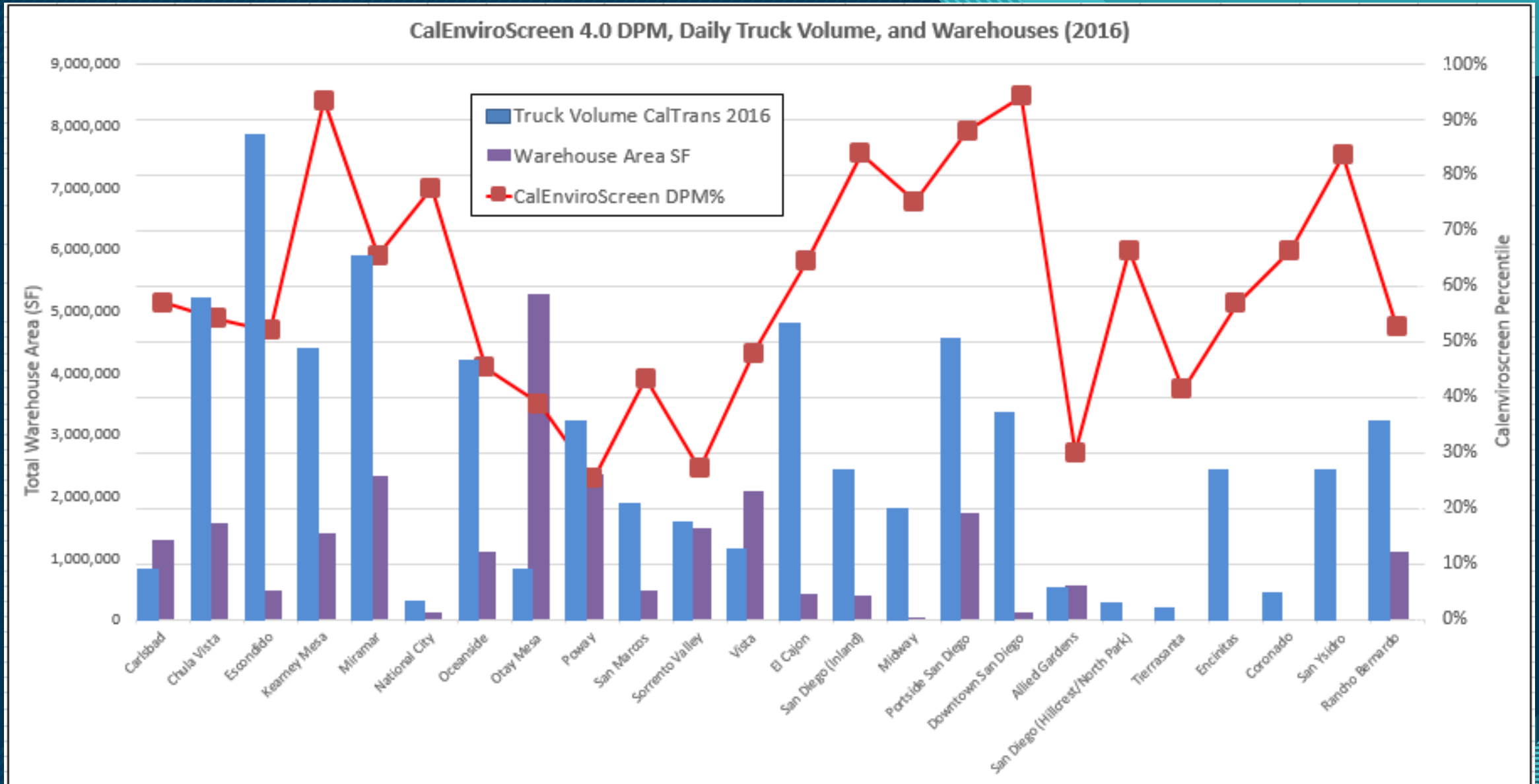


CalEnviroScreen and CalTrans Truck Traffic

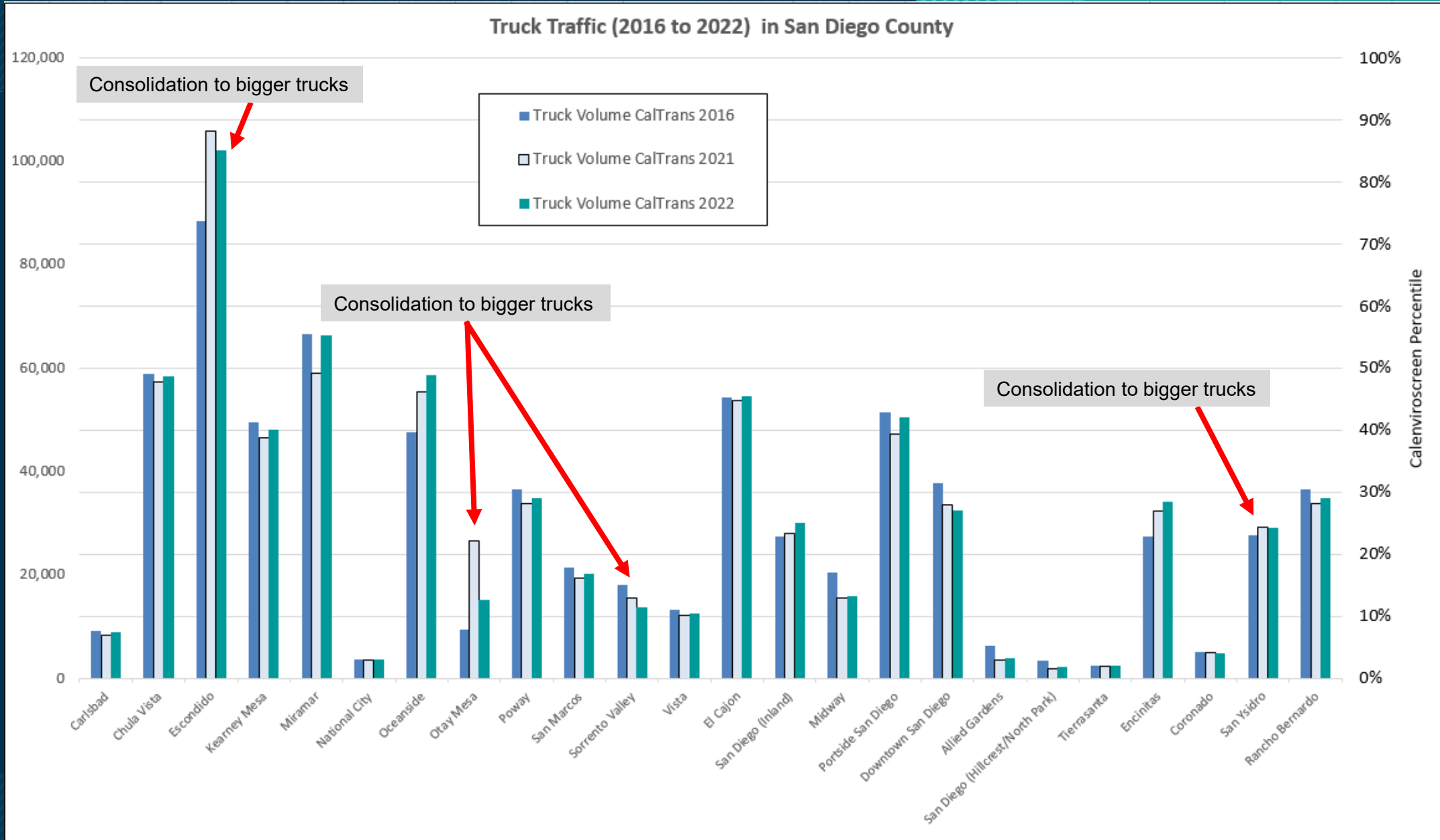
CalEnviroScreen 4.0 DPM & Traffic Percentiles and Truck Traffic (2016) in San Diego County



Warehouses, Truck Traffic, and DPM Percentiles (2016)

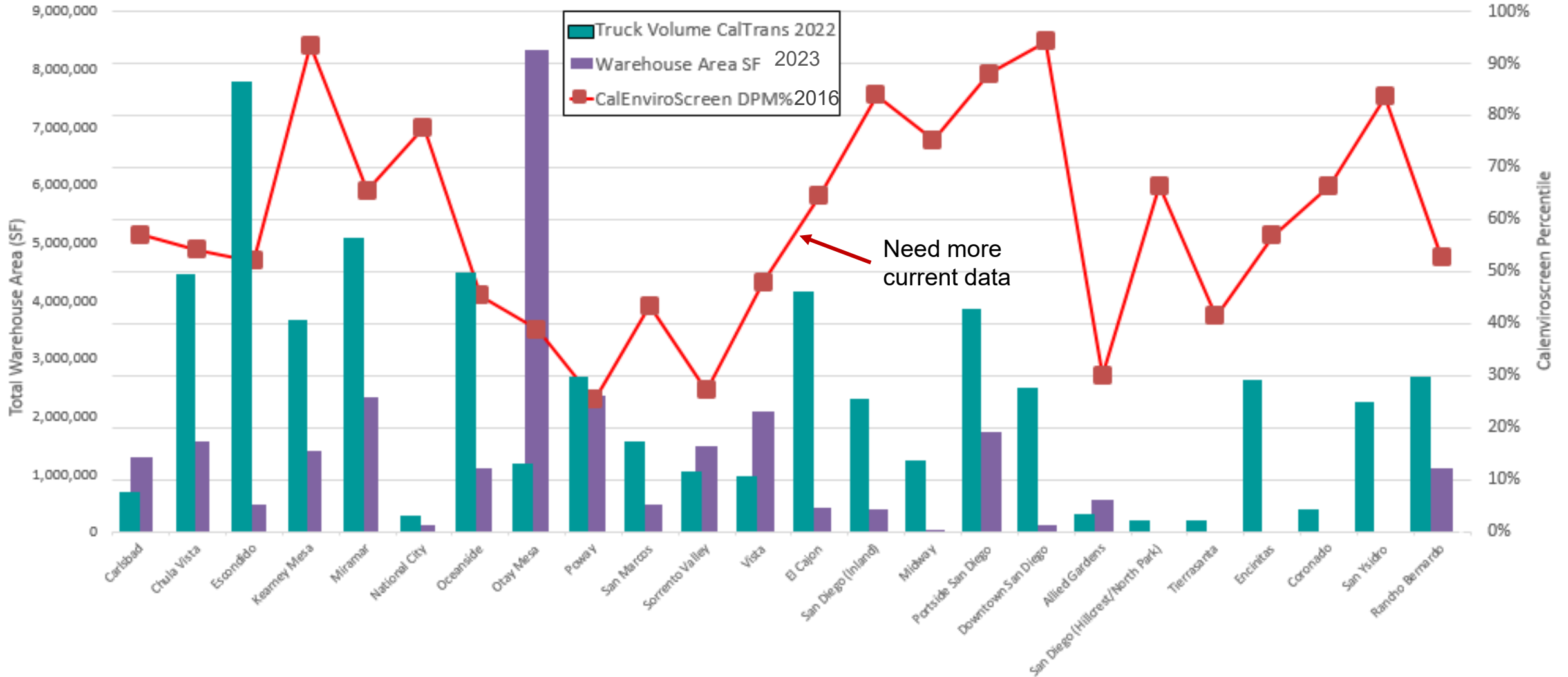


How has Truck Traffic Changed Over Time?



Warehouses, Truck Traffic, and DPM Percentiles (Current)

CalEnviroScreen 4.0 DPM to Daily Truck Volume (2022) in San Diego County with Warehouses (Present)



Current/Upcoming Regulations for Diesel Vehicles

Low Carbon Fuel Standard

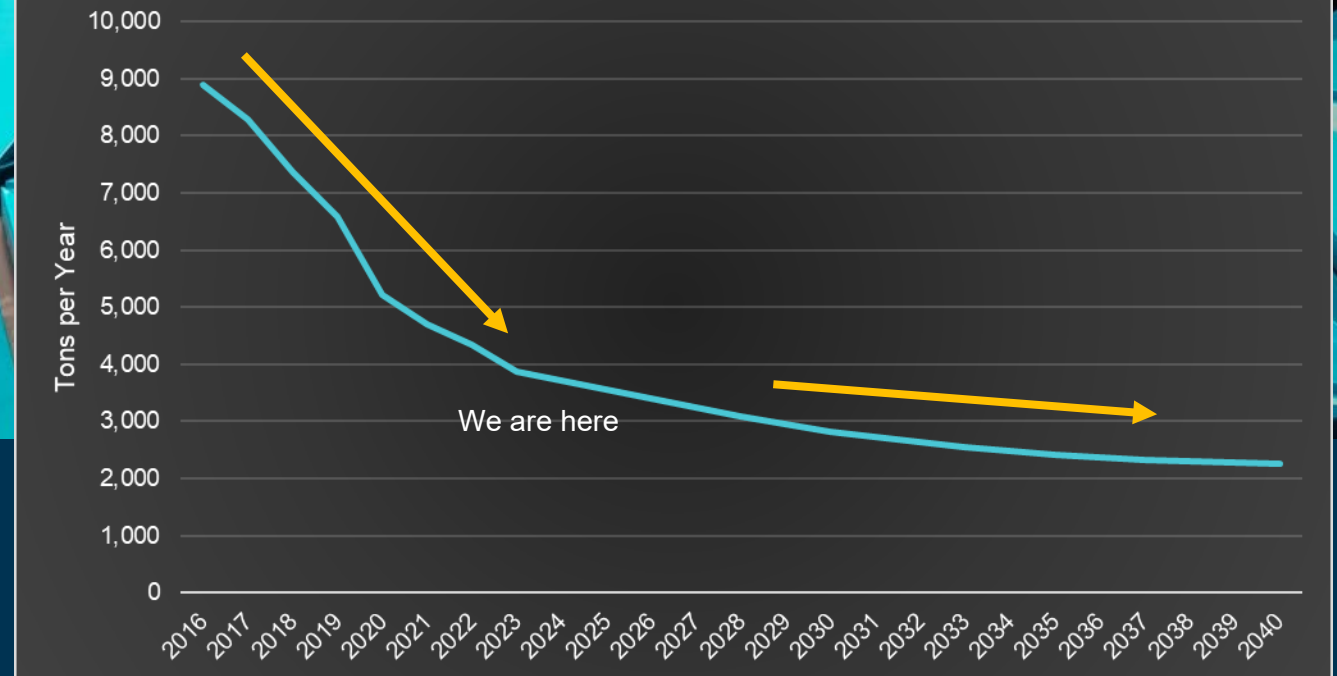
EPA Heavy-Duty Engine and Vehicle Standards

Clean Truck Check / Advanced Clean Trucks

Advanced Clean Fleets Rule (Not yet modeled)

EMFAC Model Projections

NOx Trajectory, Diesel/EV Truck Sources



What is the trajectory?

CARB's EMFAC(2021) Model accounts for:

- 1) Expanding EV population
- 2) Increase in overall VMT
- 3) Emissions:
 - Tail-pipe exhaust
 - Tire wear
 - Brake wear
 - Regenerative braking for EVs (50%)

Note: EMFAC does not account for road wear emissions

Total Mobile PM 2.5 Emissions

Mobile PM 2.5 Emissions (CARB CEPAM 2019.V3)



- EMFAC (previous slide) – does not include road wear
- CEPAM (Also CARB Model)- includes all forms
 - Mobile, Stationary, Off-road, Area
- Exhaust emissions continue to decline
- Tires, brakes, road wear increase
 - Aging roads and infrastructure
 - Heavier vehicles
 - Increased VMT

Questions/Thoughts to Consider

What proportion of trucks in San Diego would an ISR capture?

- High truck traffic areas in San Diego County do not correlate strongly with areas where warehouses are located

How much reduction in air pollution could we expect from an ISR?

- Overall PM 2.5 projected to stay constant throughout transition
- NOx - biggest reduction, ~40% by 2040 as modeled before ACF and an ISR
 - ISR *may* accelerate EV adoption – keep infrastructure & supply chain risks in mind

Would an ISR help the communities with the worst air quality?

- NOx (ozone) reductions - benefit 28 out 184 Census Tracts with worse than average ozone pollution

Would an ISR and/or targeted incentive program for businesses/warehouses with high Ozone Census Tracts be feasible?

- El Cajon (13 Census Tracts)
- Escondido (10 Census Tracts)

We need to better communicate the overall risk from PM 2.5 to San Diego communities

- PM 2.5 from brake dust, road wear, and tires also hazardous (CARB, Medical Research Council, UK)
- Would electrification dramatically reduce health risk?

Thank You!

**Comments?
Suggestions?**