Calculation of 2017 Crude Average Carbon Intensity Value

Posting: Section 95489(c)(3) of the Low Carbon Fuel Standard (LCFS) Regulation[1] states that each year the Executive Officer will post the Annual Crude Average carbon intensity calculation at the ARB-LCFS website for public comment. Written comments shall be accepted for 15 calendar days following the date on which the analysis was posted. Only comments related to potential factual or methodological errors in the posted Annual Crude Average carbon intensity value may be considered. The Executive Officer shall evaluate the comments received and, if the Executive Officer deems it necessary, may request in writing additional information or clarification from the commenters. Commenters shall have 10 days to respond to these requests. The Executive Officer shall post the final Annual Crude Average carbon intensity value at the ARB-LCFS website within 15 days of completion of the comment period, if no comments are received. If comments are received, the Executive Officer shall post the final Annual Crude Average carbon intensity value within 30 days of completion of the comment period or within 25 days of the latest request by the Executive Officer for additional information or clarification from a commenter, whichever is later.

Calculation of 2015, 2016 and 2017 Annual Crude Average Carbon Intensity Values: Table 1 shows California crude volumes and Annual Crude Average carbon intensity values for 2015, 2016 and 2017. Tables 2, 3 and 4 show breakdowns of the sources of crude oil supplied to California refineries during 2015, 2016 and 2017 as well as the carbon intensity values assigned to these crude sources.[2] All crude oil produced in and offshore of California during the time period of 2015 to 2017 was assumed to be refined in California.[3] The volume contributions for California produced crudes are based on oil production data obtained from the California Department of Conservation.[4] The volume contributions for California federal offshore crudes are based on oil production data obtained from the Bureau of Safety and Environmental Enforcement.[5] The volume contributions of imported crudes are based on oil supply data submitted by refineries as part of annual LCFS reporting. The annual crude average carbon intensity values are a volume-weighted average of the carbon intensities for the crudes supplied in a given year.

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[1] The LCFS regulation is published at California Code of Regulations (CCR), title 17, sections 95480-95497. Subsequent section references are to CCR title 17.

[2] Crude carbon intensity values are from Table 8 of the LCFS regulation https://www.arb.ca.gov/regact/2015/lcfs2015/lcfsfinalregorder.pdf. These carbon intensity values are based on oil field data from the year 2012.

[3] The total volume of California state and federal offshore crude supplied to California refineries as reported to ARB was 623 million barrels, which closely matches the total volume reported by oil producers to California Department of Conservation and Bureau of Safety and Environmental Enforcement of 621 million barrels.

[4] California Department of Conservation, Online Production and Injection Query and Database, http://opi.consrv.ca.gov/opi/opi.dll (accessed May 19, 2016, May 10, 2017, and April 13, 2018).

[5] Bureau of Safety and Environmental Enforcement website https://www.data.bsee.gov/Main/PacificProduction.aspx (accessed April 21, 2016, May 11, 2017 and May 9, 2018).

Table 1: Crude Volumes and Annual Crude Average Carbon Intensity Values

Year	2015	2016	2017
CI (gCO_2e/MJ)	12.06	12.14	11.93
Volume (bbl)	605,749,048	582,101,235	621,246,732

Calculation of California Baseline Crude Average Carbon Intensity:
$CI_{BaselineCrudeAve}$ is the California Baseline Crude Average carbon intensity value, in gCO2e/MJ, attributed to the production and transport of the crude oil supplied as petroleum feedstock to California refineries during the baseline calendar year, 2010, and is calculated by the following formula for the 2017 compliance period:

$$CI_{BaselineCrudeAve} = \frac{[11.98 \times 605{,}749{,}048 + 11.98 \times 582{,}101{,}235 + 11.98 \times 621{,}246{,}732]}{[605{,}749{,}048 + 582{,}101{,}235 + 621{,}246{,}732]}$$

$$CI_{BaselineCrudeAve} = 11.98$$

Calculation of Three-Year California Crude Average Carbon Intensity:
$CI_{2017CrudeAve}$ is the Three-year California Crude Average carbon intensity value, in gCO2e/MJ, attributed to the production and transport of the crude oil supplied as petroleum feedstock to California refineries during the most recent three calendar years (2015, 2016 and 2017), and is calculated by the following formula:

$$CI_{2017CrudeAve} = \frac{[12.06 \times 605{,}749{,}048 + 12.14 \times 582{,}101{,}235 + 11.93 \times 621{,}246{,}732]}{[605{,}749{,}048 + 582{,}101{,}235 + 621{,}246{,}732]}$$

$$CI_{2017CrudeAve} = 12.04$$

Summary: The Three-year California Crude Average carbon intensity of 12.04 gCO2e/MJ is less than the California Baseline Crude Average carbon intensity of 11.98 gCO2e/MJ plus 0.10 gCO2e/MJ. Therefore, pursuant to section 95489(b) of the LCFS regulation, no incremental deficits for CARBOB or diesel will be added to each affected regulated party's compliance obligation for the annual compliance period of 2019.

Table 2: 2015 Refinery Crude Supply

Country/State	Crude Name	2012 CI (g/MJ)	2015 Volume (bbl)
	2015 Volume Weighted Average CI	12.06	605,749,048
Angola	Clov	8.25	4,204,843
	Girassol	10.33	1,118,099
	Greater Plutonio	9.78	1,774,496
	Hungo	9.10	1,486,409
	Pazflor	8.91	3,119,864
	Sangos	11.98	3,051,709
Australia	Pyrenees	5.99	454,412
	Vincent	5.05	652,505
Belize	Belize Light	11.98	360,417
Brazil	Bijupira Salema	8.08	433,868
	Iracema (Cernambi)	11.98	5,078,582
	Lula	9.94	2,931,225
	Ostra	6.54	337,723
	Peregrino	11.98	302,079
	Sapinhoa	8.53	5,694,501
	Tubarao Azul	11.98	26,098
	Tubarao Martelo	11.98	104,143
Canada	Access Western Blend	16.31	247,794
	Albian Heavy Synthetic (all grades)	19.90	1,463,238
	Boundary Lake	8.27	102,760
	Burnaby Blend	11.98	154,030
	Canadian Conventional Heavy	9.27	269,969
	Cold Lake	18.40	3,605,136
	Kearl Lake	12.05	308,662
	Mixed Sweet	8.27	1,707,626
	Shell Synthetic (all grades)	21.39	199,994
	Suncor Synthetic (all grades)	23.71	2,286,703
	Surmont Heavy Blend	18.26	792,787
	Wabasca	6.79	269,509
	Western Canadian Select	18.43	29,942
Colombia	Castilla	9.61	4,374,828
	Magdalena	21.01	3,066,144
	South Blend	9.22	3,669,732

	Vasconia	9.33	30,722,134
Ecuador	Napo	9.56	23,122,264
	Oriente	10.90	39,409,691
Equatorial Guinea	Ceiba	10.88	1,713,733
Iraq	Basra Light	13.08	17,149,050
Kuwait	Kuwait	10.31	26,477,992
Mexico	Isthmus	10.16	359,910
Peru	Loreto	8.23	687,938
	Pirana	11.98	249,579
Russia	ESPO	13.70	3,264,866
	Sokol	10.51	536,721
Saudi Arabia	Arab Extra Light	9.35	27,322,040
	Arab Light	9.15	81,249,853
	Arab Medium	8.66	5,423,168
Venezuela	Boscan	10.76	1,602,120
	Hamaca DCO	7.63	692,490
US Alaska	ANS	12.93	75,321,220
US Colorado	Niobrara	8.03	1,330,366
US Gulf of Mexico	Mars	11.98	304,100
US Louisiana	GCA	11.98	93,626
US New Mexico	Four Corners	9.37	1,263,943
	New Mexico Sweet	9.37	236,315
US North Dakota	Bakken	10.18	862,859
US Texas	Eagle Ford Shale	12.03	134,093
US Utah	Utah Sweet	5.99	351,327
	Utah Black Wax	5.09	169,700
US Wyoming	Wyoming Sweet	24.11	70,744
US California	Aliso Canyon	4.16	194,618
	Ant Hill	22.04	42,769
	Antelope Hills	6.56	111,775
	Antelope Hills, North	19.14	336,624
	Arroyo Grande	29.33	498,091
	Asphalto	8.00	225,255
	Bandini	6.78	5,910
	Bardsdale	3.63	268,388
	Barham Ranch	2.64	77,361
	Beer Nose	2.50	3,706
	Belgian Anticline	3.56	35,974

	Bellevue	7.52	31,508
	Bellevue, West	4.55	9,164
	Belmont, Offshore	4.15	621,834
	Belridge, North	4.77	2,329,514
	Belridge, South	14.84	22,901,920
	Beverly Hills	4.49	670,634
	Big Mountain	2.58	25,188
	Blackwells Corner	5.03	11,797
	Brea-Olinda	3.17	1,071,791
	Buena Vista	7.45	1,186,195
	Burrel	25.23	14,840
	Cabrillo	2.49	22,714
	Canal	4.17	23,829
	Canfield Ranch	3.99	90,987
	Carneros Creek	3.40	19,447
	Cascade	2.12	159,831
	Casmalia	9.35	198,338
	Castaic Hills	2.52	5,812
	Cat Canyon	4.08	1,289,170
	Cheviot Hills	3.39	31,173
	Chico-Martinez	15.81	199,064
	Cienaga Canyon	4.08	23,212
	Coalinga	27.85	6,780,338
	Coles Levee, N	4.56	210,258
	Coles Levee, S	2.70	71,286
	Comanche	7.88	22,968
	Coyote, East	6.15	239,183
	Cuyama, South	14.43	192,364
	Cymric	19.23	16,544,912
	Deer Creek	9.96	38,926
	Del Valle	4.73	43,930
	Devils Den	5.88	13,338
	Edison	15.55	747,779
	El Segundo	3.77	25,318
	Elk Hills	6.30	11,231,816
	Elwood, S., Offshore	3.57	497,254
	Fruitvale	3.87	460,887
	Greeley	9.60	108,477

	Hasley Canyon	2.15	26,148
	Helm	3.93	47,364
	Holser	3.04	20,135
	Honor Rancho	4.09	70,309
	Huntington Beach	5.11	2,472,233
	Hyperion	2.05	10,369
	Inglewood	9.52	2,376,814
	Jacalitos	2.40	113,835
	Jasmin	12.77	112,176
	Kern Front	25.10	5,005,420
	Kern River	9.63	25,684,157
	Kettleman Middle Dome	3.70	87,981
	Kettleman North Dome	5.14	171,640
	Landslide	12.17	31,189
	Las Cienegas	4.63	279,585
	Livermore	2.56	9,687
	Lompoc	19.65	345,984
	Long Beach	6.84	1,639,756
	Long Beach Airport	4.02	10,101
	Los Angeles Downtown	5.71	42,492
	Los Angeles, East	10.02	12,161
	Lost Hills	10.26	11,209,502
	Lost Hills, Northwest	3.91	16,358
	Lynch Canyon	12.00	268,814
	Mahala	2.70	7,298
	McCool Ranch	3.32	27,873
	McDonald Anticline	4.30	60,061
	McKittrick	24.64	3,334,461
	Midway-Sunset	25.05	28,163,266
	Montalvo, West	2.28	399,469
	Montebello	14.96	507,852
	Monument Junction	3.62	96,716
	Mount Poso	11.17	1,303,617
	Mountain View	3.71	95,609
	Newhall-Potrero	2.85	107,690
	Newport, West	4.38	85,699
	Oak Canyon	3.50	22,522
	Oak Park	2.48	13,925

	Oakridge	2.39	113,970
	Oat Mountain	2.59	74,677
	Ojai	2.75	238,334
	Olive	1.98	68,485
	Orcutt	12.71	1,140,191
	Oxnard	9.16	326,774
	Paloma	3.51	17,106
	Placerita	31.20	879,526
	Playa Del Rey	4.58	46,480
	Pleito	2.60	1,249,956
	Poso Creek	28.15	4,137,105
	Pyramid Hills	3.34	55,893
	Railroad Gap	5.05	83,256
	Raisin City	8.72	112,082
	Ramona	3.41	41,606
	Richfield	4.40	296,903
	Rincon	3.93	270,538
	Rio Bravo	5.75	329,409
	Rio Viejo	2.87	42,527
	Riverdale	3.74	54,922
	Rose	2.70	399,905
	Rosecrans	5.52	147,910
	Rosecrans, South	3.11	9,467
	Rosedale	6.49	17,171
	Rosedale Ranch	8.00	149,044
	Round Mountain	25.99	3,610,219
	Russell Ranch	7.56	48,831
	Salt Lake	2.67	46,379
	Salt Lake, South	3.84	16,683
	San Ardo	27.26	7,795,661
	San Miguelito	5.65	422,815
	San Vicente	2.47	226,885
	Sansinena	2.56	139,140
	Santa Clara Avenue	3.49	44,356
	Santa Fe Springs	10.50	939,517
	Santa Maria Valley	5.15	203,347
	Santa Susana	2.93	13,936
	Sargent	3.98	26,784

	Saticoy	3.33	34,119
	Sawtelle	3.18	187,851
	Seal Beach	5.08	420,447
	Semitropic	3.48	35,096
	Sespe	2.79	404,945
	Shafter, North	3.01	598,178
	Shiells Canyon	3.38	72,929
	South Mountain	3.31	641,600
	Stockdale	2.13	127,532
	Tapia	7.55	18,789
	Tapo Canyon, South	2.92	9,800
	Tejon	6.49	365,138
	Tejon Hills	6.47	12,846
	Tejon, North	3.14	34,268
	Temescal	2.75	69,640
	Ten Section	6.60	79,708
	Timber Canyon	2.99	27,589
	Torrance	4.49	364,790
	Torrey Canyon	2.73	124,284
	Union Avenue	3.57	5,288
	Ventura	4.61	4,746,716
	Wayside Canyon	1.67	27,229
	West Mountain	2.84	9,579
	Wheeler Ridge	4.28	102,447
	White Wolf	1.88	11,658
	Whittier	2.42	96,315
	Wilmington	7.02	13,660,268
	Yowlumne	10.62	101,829
	Zaca	8.16	232,480
US Federal OCS	Beta	1.71	2,036,833
	Carpinteria	2.85	355,145
	Dos Cuadras	4.00	908,709
	Hondo	5.54	1,959,967
	Hueneme	3.04	115,165
	Pescado	5.72	994,848
	Point Arguello	14.23	569,983
	Point Pedernales	9.38	1,890,073
	Sacate	3.59	935,703

	Santa Clara	2.47	823,404
	Sockeye	8.35	638,669

Table 3: 2016 Refinery Crude Supply

Country/State	Crude Name	2012 CI (g/MJ)	2016 Volume (bbl)
	2016 Volume Weighted Average CI	12.14	582,101,235
Angola	Clov	8.25	15,190
	Dalia	9.78	1,474,555
	Girassol	10.33	957,592
	Greater Plutonio	9.78	2,091,565
	Hungo	9.10	420,075
	Pazflor	8.91	5,330,519
	Sangos	11.98	735,882
Argentina	Escalante	9.30	805,623
Australia	Pyrenees	5.99	75,454
	Vincent	5.05	657,236
Belize	Belize Light	11.98	147,660
Brazil	Iracema (Cernambi)	11.98	5,930,893
	Lula	9.94	941,247
	Papa Terra	11.98	305,180
	Sapinhoa	8.53	1,939,517
	Tubarao Azul	11.98	63,760
	Tubarao Martelo	11.98	710,667
Canada	Access Western Blend	16.31	167,231
	Albian Heavy Synthetic (all grades)	19.90	1,382,106
	Burnaby Blend	11.98	342,430
	Canadian Conventional Heavy	9.27	8,028
	Christina Dilbit Blend	13.34	71,874
	Christina Synbit	17.43	61,151
	Cold Lake	18.40	3,205,705
	Kearl Lake	12.05	1,235,972
	Koch Alberta	8.27	63,119
	Mixed Sweet	8.27	320,359
	Peace River Sour	8.27	63,807
	Suncor Synthetic (all grades)	23.71	557,872
	Surmont Heavy Blend	18.26	895,151
Colombia	Acordionero	11.98	622,982
	Castilla	9.61	4,047,210
	Magdalena	21.01	3,658,417

	Puerto Bahia	11.98	50,732
	South Blend	9.22	2,517,964
	Vasconia	9.33	32,668,178
Ecuador	Napo	9.56	30,282,738
	Oriente	10.90	43,489,670
Equatorial Guinea	Ceiba	10.88	2,194
	Zafiro	21.56	596,645
Ghana	Ten Blend	11.98	78,119
Iraq	Basra Light	13.08	13,028,012
	Basra Heavy	11.98	926,750
Kuwait	Kuwait	10.31	26,980,599
Mexico	Isthmus	10.16	699,917
Nigeria	Antan	33.44	556,452
Oman	Oman	12.35	10,979,852
Peru	Loreto	8.23	228,059
	Pirana	11.98	435,001
Russia	ESPO	13.70	2,920,405
	Sokol	10.51	228,115
Saudi Arabia	Arab Extra Light	9.35	25,886,753
	Arab Light	9.15	68,991,575
	Arab Medium	8.66	12,313,808
UAE	Upper Zakum	8.97	995,767
Venezuela	Boscan	10.76	17,570
	Hamaca DCO	7.63	576,941
	Zuata (all grades)	23.51	538,266
US Alaska	ANS	12.93	73,604,859
US Colorado	Niobrara	8.03	166,664
US New Mexico	Four Corners	9.37	836,544
US North Dakota	Bakken	10.18	169,116
US Utah	Utah Sweet	5.99	14,331
US California	Aliso Canyon	4.16	117,447
	Ant Hill	22.04	38,810
	Antelope Hills	6.56	94,342
	Antelope Hills, North	19.14	289,014
	Arroyo Grande	29.33	572,247
	Asphalto	8.00	193,898
	Bandini	6.78	5,917
	Bardsdale	3.63	195,993

	Barham Ranch	2.64	93,236
	Beer Nose	2.50	7,033
	Belgian Anticline	3.56	30,739
	Bellevue	7.52	23,644
	Bellevue, West	4.55	8,439
	Belmont, Offshore	4.15	561,214
	Belridge, North	4.77	2,100,802
	Belridge, South	14.84	22,537,553
	Beverly Hills	4.49	552,472
	Big Mountain	2.58	20,805
	Blackwells Corner	5.03	11,285
	Brea-Olinda	3.17	1,032,422
	Buena Vista	7.45	1,167,228
	Burrel	25.23	11,051
	Cabrillo	2.49	18,699
	Canal	4.17	16,593
	Canfield Ranch	3.99	76,102
	Carneros Creek	3.40	19,365
	Cascade	2.12	131,662
	Casmalia	9.35	129,666
	Castaic Hills	2.52	6,384
	Cat Canyon	4.08	1,185,719
	Cheviot Hills	3.39	40,514
	Chico-Martinez	15.81	68,133
	Cienaga Canyon	4.08	16,950
	Coalinga	27.85	6,395,643
	Coles Levee, N	4.56	194,790
	Coles Levee, S	2.70	64,197
	Comanche	7.88	16,793
	Coyote, East	6.15	235,254
	Cuyama, South	14.43	168,558
	Cymric	19.23	16,944,262
	Deer Creek	9.96	32,255
	Del Valle	4.73	30,320
	Devils Den	5.88	10,680
	Edison	15.55	561,860
	El Segundo	3.77	22,416
	Elk Hills	6.30	10,053,472

	Fruitvale	3.87	398,412
	Greeley	9.60	112,640
	Hasley Canyon	2.15	23,663
	Helm	3.93	72,749
	Holser	3.04	15,478
	Honor Rancho	4.09	45,742
	Huntington Beach	5.11	2,255,128
	Hyperion	2.05	10,393
	Inglewood	9.52	2,087,420
	Jacalitos	2.40	96,228
	Jasmin	12.77	102,376
	Kern Front	25.10	4,562,279
	Kern River	9.63	24,279,701
	Kettleman Middle Dome	3.70	50,285
	Kettleman North Dome	5.14	107,613
	Landslide	12.17	28,126
	Las Cienegas	4.63	226,800
	Livermore	2.56	9,543
	Lompoc	19.65	278,844
	Long Beach	6.84	1,449,873
	Long Beach Airport	4.02	9,349
	Los Angeles Downtown	5.71	41,186
	Los Angeles, East	10.02	6,161
	Lost Hills	10.26	10,258,312
	Lost Hills, Northwest	3.91	9,872
	Lynch Canyon	12.00	253,521
	Mahala	2.70	7,343
	McCool Ranch	3.32	9,599
	McDonald Anticline	4.30	51,973
	McKittrick	24.64	3,377,085
	Midway-Sunset	25.05	24,683,165
	Montalvo, West	2.28	325,193
	Montebello	14.96	412,054
	Monument Junction	3.62	90,606
	Mount Poso	11.17	1,308,326
	Mountain View	3.71	75,434
	Newhall-Potrero	2.85	86,830
	Newport, West	4.38	78,895

	Oak Canyon	3.50	17,241
	Oak Park	2.48	13,575
	Oakridge	2.39	105,395
	Oat Mountain	2.59	69,853
	Ojai	2.75	198,628
	Olive	1.98	178,824
	Orcutt	12.71	890,961
	Oxnard	9.16	426,749
	Paloma	3.51	14,134
	Placerita	31.20	607,757
	Playa Del Rey	4.58	41,011
	Pleito	2.60	876,063
	Poso Creek	28.15	4,202,196
	Pyramid Hills	3.34	45,223
	Railroad Gap	5.05	95,243
	Raisin City	8.72	142,831
	Ramona	3.41	36,210
	Richfield	4.40	265,445
	Rincon	3.93	221,383
	Rio Bravo	5.75	271,503
	Rio Viejo	2.87	47,037
	Riverdale	3.74	47,419
	Rose	2.70	282,185
	Rosecrans	5.52	129,620
	Rosecrans, South	3.11	8,718
	Rosedale	6.49	12,202
	Rosedale Ranch	8.00	115,929
	Round Mountain	25.99	2,574,219
	Russell Ranch	7.56	45,729
	Salt Lake	2.67	48,016
	Salt Lake, South	3.84	13,147
	San Ardo	27.26	7,925,192
	San Miguelito	5.65	367,385
	San Vicente	2.47	217,116
	Sansinena	2.56	131,923
	Santa Clara Avenue	3.49	29,098
	Santa Fe Springs	10.50	877,266
	Santa Maria Valley	5.15	131,612

	Santa Susana	2.93	8,342
	Sargent	3.98	24,557
	Saticoy	3.33	29,695
	Sawtelle	3.18	172,525
	Seal Beach	5.08	386,176
	Semitropic	3.48	28,829
	Sespe	2.79	372,585
	Shafter, North	3.01	555,299
	Shiells Canyon	3.38	61,966
	South Mountain	3.31	542,001
	Stockdale	2.13	116,181
	Tapia	7.55	15,616
	Tapo Canyon, South	2.92	6,464
	Tejon	6.49	276,201
	Tejon Hills	6.47	9,994
	Tejon, North	3.14	33,072
	Temescal	2.75	69,405
	Ten Section	6.60	67,512
	Timber Canyon	2.99	25,068
	Torrance	4.49	332,852
	Torrey Canyon	2.73	112,770
	Union Avenue	3.57	565
	Ventura	4.61	4,505,876
	Wayside Canyon	1.67	10,478
	West Mountain	2.84	9,572
	Wheeler Ridge	4.28	69,873
	White Wolf	1.88	11,611
	Whittier	2.42	65,846
	Wilmington	7.02	12,551,717
	Yowlumne	10.62	63,751
	Zaca	8.16	210,226
US Federal OCS	Beta	1.71	1,923,383
	Carpinteria	2.85	324,308
	Dos Cuadras	4.00	897,918
	Hueneme	3.04	104,855
	Point Pedernales	9.38	1,471,041
	Santa Clara	2.47	739,499
	Sockeye	8.35	677,866

Table 4: 2017 Refinery Crude Supply

Country/State	Crude Name	2012 CI (g/MJ)	2017 Volume (bbl)
	2017 Volume Weighted Average CI	11.93	621,246,732
Angola	Clov	8.25	4,910,824
	Dalia	9.78	49,169
	Gimboa	9.65	190,065
	Girassol	10.33	978,649
	Greater Plutonio	9.78	2,811,735
	Nemba	10.19	542,320
	Pazflor	8.91	1,849,187
Argentina	Escalante	9.30	2,237
Australia	Pyrenees	5.99	142
	Vincent	5.05	647,811
Brazil	Iracema (Cernambi)	11.98	3,457,304
	Lula	9.94	7,652,045
	Ostra	6.54	1,608,683
	Peregrino	11.98	600,392
	Polvo	6.39	298,904
Canada	Access Western Blend	16.31	568,417
	Albian Heavy Synthetic (all grades)	19.90	168,890
	Albian Vacuum Blend	19.90	487,278
	Burnaby Blend	11.98	1,930,580
	Cold Lake	18.40	3,791,933
	Kearl Lake	12.05	3,330,330
	Mixed Sweet	8.27	164,629
	Peace River Sour	8.27	42,447
	Suncor OSP Blend	23.71	534,094
	Surmont Heavy Blend	18.26	951,762
	Synthetic Sweet Blend	22.55	165,328
	Western Canadian Select	18.43	54,578
Colombia	Castilla	9.61	9,955,567
	Magdalena	21.01	2,468,597
	Rubiales	9.20	336,967
	South Blend	9.22	3,895,959
	Vasconia	9.33	33,963,870
Ecuador	Napo	9.56	27,021,778
	Oriente	10.90	40,422,851
Equatorial Guinea	Zafiro	21.56	2,030,506
Ghana	Ten Blend	11.98	4,707,626

Iraq	Basra Light	13.08	28,247,188
Kuwait	Kuwait	10.31	18,630,962
Mexico	Isthmus	10.16	1,413,087
	Maya	7.97	30,900,575
Nigeria	Antan	33.44	1,065,251
	Escravos	20.52	952,200
Oman	Oman	12.35	5,011,826
Peru	Loreto	8.23	91,678
Russia	ESPO	13.70	2,615,656
	Sokol	10.51	2,352,359
	Vityaz	11.55	418,809
Saudi Arabia	Arab Extra Light	9.35	25,146,815
	Arab Light	9.15	58,333,462
	Arab Medium	8.66	17,898,847
Trinidad	Calypso	7.37	260,140
UAE	Murban	9.92	841,970
	Upper Zakum	8.97	919,657
Venezuela	Santa Barbara	11.98	395,200
US Alaska	ANS	12.93	83,703,472
US Colorado	Niobrara	8.03	261,576
US New Mexico	Four Corners	9.37	781,759
US Utah	Utah Sweet	5.99	301,740
US California	Aliso Canyon	4.16	82,716
	Ant Hill	22.04	14,770
	Antelope Hills	6.56	102,598
	Antelope Hills, North	19.14	258,651
	Arroyo Grande	29.33	546,410
	Asphalto	8.00	171,474
	Bandini	6.78	5,519
	Bardsdale	3.63	145,029
	Barham Ranch	2.64	75,932
	Beer Nose	2.50	6,165
	Belgian Anticline	3.56	25,116
	Bellevue	7.52	22,931
	Bellevue, West	4.55	23,428
	Belmont, Offshore	4.15	494,100
	Belridge, North	4.77	1,893,487
	Belridge, South	14.84	21,165,721
	Beverly Hills	4.49	460,782
	Big Mountain	2.58	15,267
	Blackwells Corner	5.03	10,916

	Brea-Olinda	3.17	986,549
	Buena Vista	7.45	1,207,261
	Burrel	25.23	10,758
	Cabrillo	2.49	19,054
	Canal	4.17	14,337
	Canfield Ranch	3.99	64,432
	Carneros Creek	3.40	17,097
	Cascade	2.12	116,474
	Casmalia	9.35	105,682
	Castaic Hills	2.52	6,411
	Cat Canyon	4.08	1,543,060
	Cheviot Hills	3.39	32,788
	Chico-Martinez	15.81	26,745
	Cienaga Canyon	4.08	12,984
	Coalinga	27.85	6,565,878
	Coles Levee, N	4.56	169,027
	Coles Levee, S	2.70	63,352
	Comanche	7.88	15,644
	Coyote, East	6.15	210,781
	Cuyama, South	14.43	176,949
	Cymric	19.23	16,164,807
	Deer Creek	9.96	27,799
	Del Valle	4.73	26,288
	Devils Den	5.88	8,219
	Edison	15.55	553,522
	El Segundo	3.77	24,009
	Elk Hills	6.30	9,106,174
	Fruitvale	3.87	374,086
	Greeley	9.60	127,190
	Hasley Canyon	2.15	28,362
	Helm	3.93	58,157
	Holser	3.04	14,502
	Honor Rancho	4.09	21,746
	Huntington Beach	5.11	2,012,479
	Hyperion	2.05	10,331
	Inglewood	9.52	2,032,248
	Jacalitos	2.40	86,504
	Jasmin	12.77	163,350
	Kern Front	25.10	3,683,995
	Kern River	9.63	21,935,247
	Kettleman Middle Dome	3.70	39,989

	Kettleman North Dome	5.14	99,605
	Landslide	12.17	24,669
	Las Cienegas	4.63	200,650
	Livermore	2.56	8,715
	Lompoc	19.65	235,718
	Long Beach	6.84	1,369,475
	Long Beach Airport	4.02	7,993
	Los Angeles Downtown	5.71	24,610
	Lost Hills	10.26	9,504,685
	Lost Hills, Northwest	3.91	16,674
	Lynch Canyon	12.00	230,371
	Mahala	2.70	7,325
	McCool Ranch	3.32	7,182
	McDonald Anticline	4.30	51,260
	McKittrick	24.64	2,993,687
	Midway-Sunset	25.05	22,037,573
	Montalvo, West	2.28	318,129
	Montebello	14.96	416,541
	Monument Junction	3.62	83,653
	Mount Poso	11.17	1,455,428
	Mountain View	3.71	77,540
	Newhall-Potrero	2.85	60,130
	Newport, West	4.38	70,936
	Oak Canyon	3.50	21,536
	Oak Park	2.48	9,654
	Oakridge	2.39	104,659
	Oat Mountain	2.59	64,970
	Ojai	2.75	198,165
	Olive	1.98	54,619
	Orcutt	12.71	904,607
	Oxnard	9.16	372,040
	Paloma	3.51	14,478
	Placerita	31.20	574,985
	Playa Del Rey	4.58	48,767
	Pleito	2.60	714,593
	Poso Creek	28.15	4,417,971
	Pyramid Hills	3.34	39,203
	Railroad Gap	5.05	98,624
	Raisin City	8.72	146,897
	Ramona	3.41	34,567
	Richfield	4.40	235,917

	Rincon	3.93	200,155
	Rio Bravo	5.75	231,505
	Rio Viejo	2.87	44,768
	Riverdale	3.74	75,225
	Rose	2.70	264,067
	Rosecrans	5.52	120,808
	Rosecrans, South	3.11	8,623
	Rosedale	6.49	9,690
	Rosedale Ranch	8.00	120,298
	Round Mountain	25.99	2,488,605
	Russell Ranch	7.56	47,517
	Salt Lake	2.67	48,466
	Salt Lake, South	3.84	11,496
	San Ardo	27.26	7,235,538
	San Miguelito	5.65	324,120
	San Vicente	2.47	218,810
	Sansinena	2.56	173,049
	Santa Clara Avenue	3.49	33,689
	Santa Fe Springs	10.50	806,219
	Santa Maria Valley	5.15	126,779
	Santa Susana	2.93	11,298
	Sargent	3.98	23,656
	Saticoy	3.33	28,227
	Sawtelle	3.18	158,776
	Seal Beach	5.08	376,686
	Semitropic	3.48	25,405
	Sespe	2.79	332,726
	Shafter, North	3.01	501,419
	Shiells Canyon	3.38	55,303
	South Mountain	3.31	483,988
	Stockdale	2.13	108,310
	Tapia	7.55	15,278
	Tapo Canyon, South	2.92	10,250
	Tejon	6.49	232,106
	Tejon Hills	6.47	7,913
	Tejon, North	3.14	32,599
	Temescal	2.75	63,587
	Ten Section	6.60	65,128
	Timber Canyon	2.99	26,765
	Torrance	4.49	323,362
	Torrey Canyon	2.73	89,253

	Union Avenue	3.57	5,897
	Ventura	4.61	4,077,487
	Wayside Canyon	1.67	11,090
	West Mountain	2.84	12,933
	Wheeler Ridge	4.28	59,773
	White Wolf	1.88	11,797
	Whittier	2.42	67,058
	Wilmington	7.02	11,584,753
	Yowlumne	10.62	72,457
	Zaca	8.16	187,267
US Federal OCS	Beta	1.71	1,875,907
	Carpinteria	2.85	290,342
	Dos Cuadras	4.00	889,462
	Hueneme	3.04	80,443
	Point Pedernales	9.38	1,477,191
	Santa Clara	2.47	597,254
	Sockeye	8.35	502,395

Comment: Macpherson Oil Company (MOC) supports CARB'S efforts to continue to improve the CI calculation through California's Cap and Trade program to accurately reflect the impact of crude oil production CI.

It is with this understanding and efforts MOC is seeking and asking to engage with CARB to improve the accuracy of the CI calculation.

MOC requests validation of the CI results using published actual field data submitted to and already validated by CARB. In MOC's review the results in the reference document is over-estimated by 2 to 6 times our calculations as to the carbon intensity value in the Round Mountain field.

We request a specific contact in your organization in order to clarify the carbon intensity value calculations showing for the Round Mountain field.

> Response: CARB staff followed up by phone to directly discuss this comment with Macpherson Oil Company. Based on data for natural gas and electricity consumption provided by Macpherson Oil Company, staff disagrees with the commenter's conclusion that the CI value for the Round Mountain field is over-estimated by 2 to 6 times. Nevertheless, as always CARB staff welcomes the opportunity to work with Macpherson Oil Company and other oil producers to validate the CI estimates calculated using the OPGEE model and improve the model.