Preliminary Draft Calculation of 2018 Crude Average Carbon Intensity Value

Important Note: CARB is posting this calculation as preliminary draft and will not be accepting written comments at this time. As described below, the volume contributions for California produced crudes are based on oil production data obtained from the California Department of Conservation. Due to an ongoing transition to a new database for crude oil production and injection data[1], reporting and data entry for 2018 is not complete for all California oil fields at this time. The preliminary results shown below are based on the production volumes extracted from the database dated May 7, 2019. When reporting and data entry is complete, this draft calculation will be updated and posted for public comment. In making this preliminary draft available, staff is balancing the need to post information that is normally expected to be available to LCFS market participants, while acknowledging a final calculation will be delayed pending the completion of the transition to the new database for crude oil production and injection data.

Posting: Each year, pursuant to section 95489(b)(3) of the Low Carbon Fuel Standard (LCFS) Regulation,[2] CARB posts the Annual Crude Average carbon intensity calculation at the CARB-LCFS website for public comment. Written comments shall be accepted for 15 calendar days following the date on which the final analysis is posted. Only comments related to potential factual or methodological errors in the posted Annual Crude Average carbon intensity value will be considered. CARB will evaluate the comments received, and may request in writing additional information or clarification from the commenters. Commenters shall have 10 days to respond to these requests.

Calculation of 2016, 2017 and Preliminary 2018 Annual Crude Average Carbon Intensity Values: Table 1 below shows California crude volumes and Annual Crude Average carbon intensity values for 2016, 2017 and Preliminary 2018.[3] Table 2 shows the breakdown of the sources of crude oil supplied to California refineries during 2018 as well as the carbon intensity values assigned to these crude sources.[4] All crude oil produced in and offshore of California during 2018 was assumed to be refined in California. The volume contributions for California produced crudes are based on oil production data obtained from the California Department of Conservation.[5] The volume contributions for California federal offshore crudes are based on oil production data

[1] https://www.conservation.ca.gov/dog/Documents/WellSTAR/WellSTAR-Bulletin-01-15-19.pdf
[2] The LCFS regulation is published at California Code of Regulations (CCR), title 17, sections 95480-95503. Subsequent section references are to CCR title 17.
[3] Carbon intensity values for 2016 and 2017 are from Table 9 of the LCFS regulation https://www.arb.ca.gov/fuels/lcfs/fro_oal_approved_clean_unofficial_010919.pdf . Volumes for 2016 and 2017 are from Calculation of the 2017 Crude Average Carbon Intensity Value https://www.arb.ca.gov/fuels/lcfs/crude-oil/2017_crude_average_ci_value_final.pdf
[4] Crude carbon intensity values are from Table 9 of the LCFS regulation https://www.arb.ca.gov/fuels/lcfs/fro_oal_approved_clean_unofficial_010919.pdf. These carbon intensity values are based on oil field data from the year 2015.
[5] California Department of Conservation, Online Production and Injection Query and Database, ftp://ftp.consrv.ca.gov/pub/oil/online_data/production_injection_data/ (accessed May 9, 2019).

obtained from the Bureau of Safety and Environmental Enforcement.[6] 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.

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

Year	2016	2017	Preliminary 2018
CI (gCO_2e/MJ)	12.14	11.93	12.23
Volume (bbl)	582,101,235	621,246,732	634,657,960

Calculation of California Baseline Crude Average Carbon Intensity:

$CI_{BaselineCrudeAve}$ is the California Baseline Crude Average carbon intensity value, in gCO_2e/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 2018 compliance period:

$$CI_{BaselineCrudeAve} = \frac{[11.98 \times 582{,}101{,}235 + 11.98 \times 621{,}246{,}732 + 11.78 \times 634{,}657{,}960]}{[582{,}101{,}235 + 621{,}246{,}732 + 634{,}657{,}960]}$$

$$CI_{BaselineCrudeAve} = 11.91$$

Calculation of Three-Year California Crude Average Carbon Intensity:

$CI_{2018CrudeAve}$ is the Three-year California Crude Average carbon intensity value, in gCO_2e/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 (2016, 2017 and 2018), and is calculated by the following formula:

$$CI_{2018CrudeAve} = \frac{[12.14 \times 582{,}101{,}235 + 11.93 \times 621{,}246{,}732 + 12.23 \times 634{,}657{,}960]}{[582{,}101{,}235 + 621{,}246{,}732 + 634{,}657{,}960]}$$

$$CI_{2018CrudeAve} = 12.10$$

[6] Bureau of Safety and Environmental Enforcement website https://www.data.bsee.gov/Main/PacificProduction.aspx (accessed May 2, 2019).

Table 2: 2018 Refinery Crude Supply

Country/State	Crude Name	CI (g/MJ)*	2018 Volume (bbl)
	2018 Volume Weighted Average CI	12.23	634,657,960
Angola	Clov	7.31	15,622
	Dalia	8.90	2,522,982
	Gimboa	8.86	822,027
	Girassol	9.95	93,989
	Greater Plutonio	8.72	1,004,932
	Nemba	9.08	942,080
	Pazflor	8.02	4,821,795
Argentina	Escalante	10.15	1,772,197
Australia	Pyrenees	8.24	6,568
Brazil	Atlanta	11.78	658,824
	Frade	5.63	1,002,884
	Iracema (Cernambi)	5.54	6,031,213
	Lula	6.24	9,290,082
	Mero	11.78	502,121
	Ostra	5.65	3,070,178
	Peregrino	4.16	623,038
	Sapinhoa	6.00	7,342,701
	Tubarao Martelo	5.37	727,064
Brunei	Seria Light Export Blend	11.78	194,914
Canada	Access Western Blend	15.15	1,776,677
	Albian Heavy Synthetic (all grades)	23.68	868,227
	Burnaby Blend	11.78	278,000
	Christina Dilbit Blend	12.71	327,314
	Cold Lake	17.87	4,875,687
	Fort Hills	11.78	681,348
	Kearl Lake	12.89	3,046,505
	Mixed Sweet	8.11	79,064
	Peace River Sour	8.11	3,250
	Surmont Heavy Blend	22.48	1,485,537
	Syncrude Synthetic (all grades)	31.62	371,605
	Western Canadian Select	19.04	182,451
Colombia	Acordionero	6.96	325,884
	Castilla	10.55	4,739,922
	Chaza	11.78	1,816,689
	Puerto Bahia	11.78	365,442
	South Blend	9.25	1,347,224

	Vasconia	9.62	37,540,768
Ecuador	Napo	8.31	21,851,807
	Oriente	10.07	31,593,153
Equatorial Guinea	Zafiro	20.56	3,850,536
Ghana	Ten Blend	8.08	3,155,969
Iraq	Basra Light	13.45	30,808,908
Kuwait	Kuwait	10.56	19,671,534
Mexico	Maya	7.85	18,504,160
Nigeria	Antan	21.98	2,117
	Bonga	5.06	1,870,925
	Forcados	8.97	1,928,189
Oman	Oman	13.32	112,128
Peru	Pirana	8.43	261,510
Russia	CPC Blend	11.78	1,299,450
	ESPO	11.55	792,718
	Sokol	6.94	3,504,791
	Vityaz	9.60	400,544
Saudi Arabia	Arab Extra Light	9.41	26,050,894
	Arab Light	9.23	81,309,036
	Arab Medium	8.72	21,004,457
	Arab Heavy	7.92	230,100
Trinidad	Calypso	7.41	99,550
	Molo	11.78	551,366
UAE	Upper Zakum	7.96	75,844
UK	North Sea Kraken	11.78	788,353
Venezuela	Hamaca	23.04	547,870
	Hamaca DCO	10.02	669,250
	Santa Barbara	17.32	2,170
US Alaska	ANS	15.91	83,471,217
US New Mexico	Four Corners	11.11	932,754
US Texas	West Texas Intermediate	11.93	467,041
US Utah	Covenant	4.43	52,139
	Utah Sweet	6.92	768,597
US California**	Aliso Canyon	4.94	
	Ant Hill	20.81	
	Antelope Hills	2.84	
	Antelope Hills, North	24.75	
	Arroyo Grande	31.11	
	Asphalto	8.01	
	Bandini	3.09	
	Bardsdale	3.47	

	Barham Ranch	4.15	
	Beer Nose	3.98	
	Belgian Anticline	5.01	
	Bellevue	5.95	
	Bellevue, West	6.60	
	Belmont, Offshore	5.12	
	Belridge, North	4.11	
	Belridge, South	17.09	
	Beverly Hills	5.41	
	Big Mountain	4.65	
	Blackwells Corner	3.07	
	Brea-Olinda	3.59	
	Brentwood	11.78	
	Buena Vista	7.44	
	Burrel	29.43	
	Cabrillo	4.14	
	Cal Canal Gas	11.78	
	Canal	4.40	
	Canfield Ranch	4.53	
	Carneros Creek	4.06	
	Cascade	3.00	
	Casmalia	10.26	
	Castaic Hills	2.68	
	Cat Canyon	7.83	
	Cheviot Hills	3.49	
	Chico-Martinez	48.13	
	Cienaga Canyon	5.78	
	Coalinga	25.81	
	Coles Levee, N	4.09	
	Coles Levee, S	5.87	
	Comanche	5.03	
	Coyote, East	5.96	
	Cuyama, South	14.70	
	Cymric	15.69	
	Deer Creek	11.51	
	Del Valle	5.78	
	Devils Den	7.51	
	Dominguez	3.57	
	Edison	14.53	
	El Segundo	4.38	
	Elk Hills	8.02	

	Fruitvale	3.75	
	Greeley	7.91	
	Hasley Canyon	2.25	
	Helm	3.99	
	Holser	3.80	
	Honor Rancho	3.43	
	Huntington Beach	6.62	
	Hyperion	1.90	
	Inglewood	10.06	
	Jacalitos	2.72	
	Jasmin	16.59	
	Kern Bluff	12.54	
	Kern Front	35.68	
	Kern River	15.09	
	Kettleman Middle Dome	3.93	
	Kettleman North Dome	3.42	
	Landslide	12.53	
	Las Cienegas	4.96	
	Livermore	2.66	
	Lompoc	28.45	
	Long Beach	5.48	
	Long Beach Airport	4.92	
	Los Angeles Downtown	5.89	
	Los Angeles, East	14.71	
	Lost Hills	12.99	
	Lost Hills, Northwest	5.36	
	Lynch Canyon	23.10	
	Mahala	4.99	
	McCool Ranch	9.59	
	McDonald Anticline	4.33	
	McKittrick	25.31	
	Midway-Sunset	29.33	
	Montalvo, West	2.65	
	Montebello	17.03	
	Monument Junction	4.95	
	Mount Poso	3.71	
	Mountain View	3.97	
	Newhall	11.78	
	Newhall-Potrero	3.66	
	Newport, West	5.21	
	Oak Canyon	4.04	

	Oak Park	3.01	
	Oakridge	3.46	
	Oat Mountain	3.17	
	Ojai	4.94	
	Olive	1.82	
	Orcutt	11.76	
	Oxnard	5.39	
	Paloma	4.88	
	Placerita	32.78	
	Playa Del Rey	6.87	
	Pleito	2.09	
	Poso Creek	21.96	
	Pyramid Hills	3.36	
	Railroad Gap	7.08	
	Raisin City	9.13	
	Ramona	4.47	
	Richfield	4.75	
	Rincon	4.88	
	Rio Bravo	6.98	
	Rio Viejo	2.74	
	Riverdale	3.80	
	Rose	2.91	
	Rosecrans	5.76	
	Rosecrans, South	3.54	
	Rosedale	2.35	
	Rosedale Ranch	8.32	
	Round Mountain	24.04	
	Russell Ranch	8.58	
	Salt Lake	3.18	
	Salt Lake, South	6.34	
	San Ardo	26.42	
	San Miguelito	5.25	
	San Vicente	3.22	
	Sansinena	3.21	
	Santa Clara Avenue	3.53	
	Santa Fe Springs	12.53	
	Santa Maria Valley	4.80	
	Santa Susana	5.29	
	Sargent	4.00	
	Saticoy	3.68	
	Sawtelle	2.56	

	Seal Beach	5.19	
	Semitropic	4.30	
	Sespe	3.98	
	Shafter, North	3.32	
	Shiells Canyon	5.07	
	South Mountain	3.58	
	Stockdale	2.18	
	Tapia	6.92	
	Tapo Canyon, South	3.08	
	Tejon	13.77	
	Tejon Hills	9.39	
	Tejon, North	5.63	
	Temescal	3.40	
	Ten Section	7.50	
	Torrance	3.99	
	Torrey Canyon	3.52	
	Union Avenue	5.58	
	Vallecitos	4.53	
	Ventura	4.54	
	Wayside Canyon	2.36	
	West Mountain	3.53	
	Wheeler Ridge	2.80	
	White Wolf	1.92	
	Whittier	3.71	
	Wilmington	8.31	
	Yowlumne	13.90	
	Zaca	9.53	
US Federal OCS	Beta	1.59	
	Carpinteria	3.28	
	Dos Cuadras	4.57	
	Hueneme	4.67	
	Point Pedernales	8.26	
	Santa Clara	2.46	

*CI values from Table 9 of the LCFS regulation are based on oil field operational data from the year 2015

**Volumes for California produced crudes are intentionally left out for this preliminary draft release