MINERAL PROCESSES – SAND & GRAVEL EXCAVATION AND PROCESSING LOSSES

Prepared By: Hao Quinn Date: October 4, 2017 (revised April 17, 2019)

EMISSION INVENTORY SOURCE CATEGORY

Sand & Gravel Excavation and Processing Losses

EMISSION INVENTORY CODES (CES CODES) AND DESCRIPTION

430-422-7078-0000 (46995) – Mineral Processes – Sand & Gravel Excavation and Processing Losses

430-426-7078-0000 (47019) – Mineral Processes – Grinding/Crushing of Aggregates

METHOD SUMMARY

This area source methodology uses a bottom-up approach for estimating PM and PM10 emissions from (1) sand and gravel (aggregate) excavation and processing operations, and (2) cement and asphalt concrete recycling operations in Sacramento County. The bottom-up approach uses data from individual facilities in the category. EIC 430-422-7078-0000, Sand & Gravel Excavation and Processing Losses, accounts for all emissions from conveying, screening, crushing, and other processing of (1) the excavated sand and gravel operations and (2) the cement and asphalt concrete recycling operations. Since all emissions from sand, gravel and concrete recycling processing are accounted under EIC 430-422-7078-0000, Sand & Gravel Excavation and Processing Losses, there will be no emissions assigned to EIC 430-426-7078-0000, Grinding/Crushing of Aggregates. None of the available SCC-SIC combinations reconciled to EIC 430-426-7078-0000, Grinding/Crushing of Aggregates, is representative of operations in this area source category.

All seven (7) Sacramento facilities with permitted aggregate and rock crushing plants, except Bell Marine and Golden State Crushing, are point sources which are surveyed and inventoried annually. The 2016 processing data for Bell Marine and Golden State Crushing are obtained from district inspection reports. Data collected included the amount of aggregate and sand processed, controls, temporal activity, vehicle traffic and storage pile(s). All 7 permitted facilities operated in 2016. Appendix A contains 2016 survey/inspection data, emission factors and calculation for each facility, and emission summary.

Using 2016 production data and permit evaluations for emission factors, the PM and PM10 emissions¹ are determined. The emission inventory includes emissions from crushing, screening, conveying, stock piling, and fugitive emissions from storage piles and haul roads. The emission summary for EIC 430-422-7078-0000, sand and gravel processing is presented in the Table 1.

¹PM2.5 emissions, not presented in this methodology, are determined using CARB PM Speciation Profile Number 371, which is found on CARB website: <u>https://www.arb.ca.gov/ei/speciate/speciate.htm</u>.

Table 1. E	IC 430-422-7078-0000, Sand & Gravel Processing	5								
				A	mount Pro	ocessed, tp	y	Emissions, tpy		
						Recycle				
FacilNo	COMPANY	Ро	Data Year	Gravel	Sand	Concrete	Total	PM	PM10	
274	A. TEICHERT & SON	8343	2016							
274	A. TEICHERT & SON	17337	2016							
3551	A. TEICHERT & SON	19609	2016							
111	GRANITE CONSTRUCTION CO	20334	2016							
117	TRIANGLE ROCK PRODUCTS	23557	2016							
3840	A. TEICHERT & SON	14529	2016							
861	BELL MARINE INC	13983	2016							
6082	GOLDEN STATE CRUSHING DBA SCOTT SILVA	24231			included in PO 24232					
6082	GOLDEN STATE CRUSHING DBA SCOTT SILVA	24232	2016							
6082	GOLDEN STATE CRUSHING DBA SCOTT SILVA	24233			included in PO 24232					
			Total	2359926	1878929	511839	4750694	101.84	41.07	

As a cross-check of the reported production in this category, the amount of sand and gravel produced by the permitted facilities in 2016 is compared to the sand and gravel production determined with a top-down approach by disaggregating national data to Sacramento County. The United States Geological Survey (USGS) Mineral Commodity Summaries for 2016 show a national production of 1,024 million tons of construction sand and gravel (NAICS 212321) in 2015. California production of 126 million tons is disaggregated from the national production by using the ratio of California to United States for Construction Sand and Gravel valuation dollars (values of sales, shipments, receipts, revenue, or business done) from U.S. Census 2015 County Business Patterns (2015CBP). Because valuation by NAICS in the CBP is available only to the state level, the ratio of sand and gravel establishments of Sacramento County to California from the 2015 CBP is used to disaggregate state production, resulting in an estimate of 3 million tons of sand and gravel production for Sacramento County. This comparison shows the selected bottom-up approach results in production by at least greater than 1 million tons as compared to the top-down approach. This is an indication that most, if not all, of the sand and gravel processing activities are captured by this methodology and that the emissions estimated are representative of the 2016 sand and gravel processing emissions in Sacramento County. Appendix B contains the top-down calculation, USGS Mineral Commodity Summaries for 2016, and 2015 County Business Pattern for NAICS 212321 (Construction Sand and Gravel Mining).

EMISSION SUMMARY

ACTIVITY DATA SOURCE:

2016 Survey and Inspection Data

EMISSION FACTOR SOURCE:

Permit Evaluations.

TEMPORAL DATA:

Daily Activity: Weekly Activity: Monthly Activity: 8 hours per day. 5 days per week.

Month	1	2	3	4	5	6	7	8	9	10	11	12
%	3.4	8.7	7.3	8.2	10.6	11.2	11.4	12.5	9.3	6.2	6.3	5.0

The monthly percent distribution is the weighted average of mineral processing from the seven Sacramento aggregate and rock crushing plants. See Appendix A for monthly percent distribution calculation.

DATE OF THE LAST UPDATE: November 8, 2011

GROWTH PARAMETER: QUARRY_OUTPUT

EMISSIONS (2016 - ANNUAL AVERAGE TONS/DAY) UNRECONCILED

<u>EIC#</u>	PM10	РМ	NOx	SO2	VOC	со
430-422-7078-0000	0.11	0.28	0	0	0	0
430-426-7078-0000	0	0	0	0	0	0

The 2016 activity data, emission factors and calculation are in Excel file – <u>\\Fs-0921\global\PCD</u> Folders\Emissions Inventory\Area Sources\430 - Industrial Processes - Mineral Processes\Sand and Gravel Excavation and Processing and Grinding and Crushing of Aggregates\2016\sand&gravel 2016.xlsx.

CONTROL PROFILE

Mineral processing is controlled by district particulate and fugitive dust rules (Rule 401 – Ringelmann Chart (adopted 8/3/1977), Rule 402 – Nuisance (adopted 8/3/1977), Rule 403 – Fugitive Dust (adopted 8/3/1977), Rule 404 – Particulate Matter (adopted 3/11/1970), and Rule 405 – Dust and Condensed Fumes (adopted 8/1/1962)). No additional control is anticipated, thus, control profile is not necessary.

GROWTH PROFILE

QUARRY_OUTPUT (REMI nonmetallic mineral products NAICS 327) is a new growth parameter and activity assigned by CARB to EIC 430-422-7078-0000 and to EIC 430-426-7078-0000, on April 28, 2016.

Growth Data (PAD&GAP data – April 28, 2016)

AB	СО	GROWTH_PARAM	YEAR	GROACT	GF
SV	34	QUARRY_OUTPUT	1990	21.281	0.6585
SV	34	QUARRY_OUTPUT	1995	28.686	0.8877
SV	34	QUARRY_OUTPUT	1999	35.983	1.1135
SV	34	QUARRY_OUTPUT	2000	43.516	1.3466
SV	34	QUARRY_OUTPUT	2002	41.174	1.2741
SV	34	QUARRY_OUTPUT	2005	68.92	2.1328
SV	34	QUARRY_OUTPUT	2008	54.468	1.6855
SV	34	QUARRY_OUTPUT	2010	33.76	1.0447
SV	34	QUARRY_OUTPUT	2012	32.315	1
SV	34	QUARRY_OUTPUT	2015	44.446	1.3754
SV	34	QUARRY_OUTPUT	2018	46.227	1.4305
SV	34	QUARRY_OUTPUT	2020	46.766	1.4472
SV	34	QUARRY_OUTPUT	2025	48.663	1.5059
SV	34	QUARRY_OUTPUT	2030	52.564	1.6266

CHANGES FROM PREVIOUS ESTIMATE

Emissions from aggregate plants used for cement and asphalt concrete recycling are removed from EIC 430-422-7078-0000, sand and gravel (aggregate) excavation and processing. They are now accounted under EIC 430-426-7078-0000, aggregate grinding and crushing.

NEEDED CLARIFICATIONS/CORRECTIONS TO CURRENT METHOD

Both EICs include emissions from crushing, screening, conveying and fugitives from storage piles and haul road. See Appendix C for CARB emission inventory (point & area source) Reconciliation Report for EIC 430-422-7078-0000, Sand & Gravel Excavation and Processing Losses.

FUTURE PLANS FOR METHOD UPDATE/REVISION

Next scheduled update is in 2020 using 2019 data.

P:\PCD Folders\Emissions Inventory\Area Sources\430 - Industrial Processes - Mineral Processes\Sand and Gravel Excavation and Processing and Grinding and Crushing of Aggregates\2016\sand&gravel process 2016 final 20190417.docx HCQ Page 4 8/30/2019

APPENDIX A:

2016 Survey/Inspection Data, Emission Factors and Calculation for Each Facility, and Emission Summary

APPENDIX B:

Top-Down Estimate Calculation, USGS Mineral Commodity Summaries 2016, and 2015 County Business Pattern for NAICS 212321 (Construction Sand and Gravel Mining)

	constru
z	& gravel
TOP-DOW	2015 sand
-	24

931000000 metric ton = nstruction

131482 123527 Annual payroll (\$1,000) PAYANN 12.3% CA of US, valuation\$ 2.4% SAC of CA, establishment °C payroll (\$1,000) 239191 29531 First-quarter PAYQTR1 EMP P4 Paid employees for pay period including March Fil 12 (number) pe 1696 2015 establishments Number of ESTAB SAC US 2015 2015 2015 YEAR.id 1,024,100,000 tons 126,260,070 tons 2,982,521 tons Year 2012 NAICS code Meaning of 2012 Ye 2012 NAICS code NAICS code Values code 212321 Construction sands C b 212321 Construction sand C NAICS.display-[abel GEO display-label NAICS.id Geographic area name United States 6 California 505/2 Sacramento County GEO.id2 ß Geographic identifier code 0400000US06 0500000US06067 SUDDODOLO GEO.Id

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RCPTOT					eceipts (51,00		
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PAYQTR1				First-quarter	payroll (\$1,000)	N	N
PAYANN				Annual payroll	(\$1,000)	967835	24 <u>611 11347</u> 3
RCPTOT	Value of sales,	shipments,	receipts, revenue,	or business done	(\$1,000)	4850716	258039
ESTAB				Number of.	establishments	1840	115 July 120
YEAR.Id					Year	2012	2012
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U.S. Department of the Interior U.S. Geological Survey

MINERAL COMMODITY SUMMARIES 2016

Abrasives Aluminum Antimony Arsenic Asbestos Barite Bauxite Beryllium Bismuth Boron Bromine Cadmium Cement Cesium Chromium Clays Cobalt Copper Diamond **Diatomite** Feldspar

Fluorspar Gallium Garnet Gemstones Germanium Gold 🗠 Graphite Gypsum Hafnium Helium Indium lodine **Iron and Steel** Iron Ore hon Oxide Pigments Kyanite 🛛 Lead Lime

Linne Lithium Magnesium Manganese Mercury Mica Molybdenum Nickel Niobium Nitrogen Palladium Peat Perlite **Phosphate Rock** Platinum Potash Pumice **Quartz Crystal** Rare Earths Rhenium Rubidium Salt Sand and Gravel Scandium Selenium

Silicon Silver Soda Ash Stone Strontium Sulfur. Talc Tantalum Tellurium Thallium Thorium Tin Titanium Tungsten Vanadium Vermioulite Wollastonite Yttrium Zeolites Zine Zirconium

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SAND AND GRAVEL (CONSTRUCTION)1

(Data in million metric tons unless otherwise noted)²

Domestic Production and Use: Construction sand and gravel valued at \$7.2 billion was produced by an estimated 4,100 companies and government agencies from about 6,300 operations in 50 States. Leading producing States were, in order of decreasing tonnage, Texas, California, Minnesota, Washington, Michigan, Colorado, Arizona, North Dakota, Wisconsin, and Ohio, which together accounted for about 55% of total output. It is estimated that about 45% of construction sand and gravel was used as concrete aggregates; 25% for road base and coverings and road stabilization; 13% as asphaltic concrete aggregates and other bituminous mixtures; 12% as construction fill; 1% each for concrete products, such as blocks, bricks, and pipes; plaster and gunite sands; and snow and ice control; and the remaining 2% for filtration, golf courses, railroad ballast, roofing granules, and other miscellaneous uses.

The estimated output of construction sand and gravel in the 48 continuous States, 702 million tons shipped for consumption in the first 9 months of 2015, was 5% higher than the 672 million tons estimated for the same period in 2014. Additional production information by quarter for each State, geographic region, and the United States is published by the U.S. Geological Survey (USGS) in its quarterly Mineral Industry Surveys for Crushed Stone and Sand and Gravel.

Salient Statistics—United States:	<u>2011</u>	<u>2012</u>	<u>2013</u>	<u>2014</u>	<u>2015^e</u>
Production	809	816	850	°904	931
Imports for consumption	3	4	4	5	4
Exports	(³)	(°)	(°)	(~)	(*)
Consumption, apparent	812	820	854	908	935
Price, average value, dollars per ton	7.49	7.66	7.61	7.68	7.72
Employment, mines, mills, and shops, number	29,800	30,600	30,000	28,600	28,100
Net import reliance as a percentage of apparent consumption	(³)				

Recycling: Recycling of asphalt road surface layers, cement concrete surface layers, and concrete structures was increasing, although it was still a small percentage of aggregates consumption.

Import Sources (2011-14): Canada, 89%; Mexico, 7%; Norway, 1%; and other, 3%.

<u>Tariff</u> : Item	Number	Normal Trade Relations <u>12–31–15</u>
Sand, silica and quartz, less than 95% silica	2505.10.5000	Free.
Sand, other	2505.90.0000	Free.
Pebbles and gravel	2517.10.0015	Free.

Depletion Allowance: Common varieties, 5% (Domestic and foreign).

Government Stockpile: None.

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Release Date : 04/20/2017	Ĩ
NOTE: Data based on the 2015 County Business Patterns. CBP Intri tables and download files can be found at the County Business For Information on confidentiality protection, sampling error, nonsampling error, and definitions, see Survey Methodology. Data in this table represent those available when this report was created; data may not be available for all NAICS Industries or geo employees, and self-employed persons.	ess Patterns Website. xgraphiles. Excludes most government employees, railroad

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Paid employees for pay period including March 12 (number) 2012 NAICS code Versions of this Number of establishments First-quarter payroll (\$1,000) Annual payroll (\$1,000) Geographic area name table are available for the following Meaning of 2012 NAIOS code Year 100 103 Mining, quarrying, and oil and gas extraction Oil and gas extraction 2015 29,225 743,660 18,127,674 61,649,288 United States 21 years: 17,284,132, 17,284,132 17,284,132 5,435,011 2015 2015 7,906 7,906 135,482 2018 United States 211 135,482 5,435,011 2111 21111 Oil and gas extraction Oil and gas extraction 2014 United States 5,435,011 2015 7,906 135,482 2013 United States Crude petroleum and natural gas extraction Natural gas liquid extraction 2012 7,477 124,847 5,076,346 16,101,742 2015 United States 211111 2011 356,665 1,182,390 10,635 211112 2015 429 United States: 2010 13,991,877 5,404,609 5,404,609 3,614,277 191,948 Mining (except oil and gas) Coat mining United States 212 2121 2015 6.324 2009 2015 881 881 69,894 1,468,714 1,468,714 2008 United Stales Coal mining Bliominous coal and lightle surface mining 69,894 United States 21211 2015 2007 31,911 645.560 2,448,132 2006 2015 496 212111 United States 2006 Bituminous coat unde mining 37,201 812,728 2,912,795 329 Linited States 212112 2015 212113 2122 2122 21221 21221 212210 56 782 10,431 43,682 United States United States Anthracile mining Metal one mining 2015 2015 2015 2015 330 25 25 40.237 1,039,170 3.560.462 5,495 5,495 144,867 144 887 500,498 500,498 United States Iron ore mining

GEO.Id	GEO,id2	z G	EO, displa	NAIC5.Id	NAICS display-label	YEAR.Id		ESTAB	ЕМР	. 1	PAYOTR1	PAYANN	
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0100000005		U	nited Stal	21	Mining, quarrying, and oil and gas extraction	· ·	2015	29225		743060	5435011	1	7284132
0100000US		U U	nited Stat	211	Oil and gas extraction		2015	7905		135482	5435011	1	7284132
0100000005		0	Inited Stat	2111	Oil and gas extraction		2015	7905		135482	5435011	1	7284132
010000005		ű	Inited Stat	211111	Crude petroleum and natural gas extraction		2015	7477		124847	5078346	1	6101742
0100000US		Ū	inited Stat	211112	Natural gas liquid extraction		2015	429		10695	356665		1182390
010000US	;	U	nited Stal	212	Mining (except oil and gas)		2015	6324		191948	3614277	1	3991877
0100000US	;	ų	Inited Stat	2121	Coal mining		2015	881		69894	1466714		5404609
0100000US		u	Inited Stai	21211	Coal mining		2015	496		31911	645560		2448132
010000000	5	U 1	Inited Stat	212111	Bituminous coal and lighte soltate mining		2015	329		37201	812723		2912795
010000000	2		Inited Stat	212112	Anthracite mining		2015	56		782	10431		43582
010000000	5	Ľ	Inited Stai	2122	Metal ore mining		2015	330		40237	1039170		3560462
0100000US	5	L	Inited Stat	21221	Iron ore mining		2015	25		5495	144887		500498
010000005	5	ι	Inited Stai	212210	Iron ore mining		2015	25		5495	144887		1420668
010000005	\$	ι	Inited Stat	21222	Gold ore and silver ore mining		2015	185		12170	370926		1292224
01000000	s	1	Inited Stat	212221	Gold ore mining		2015	14		1405	38581		128444
01000000	S	L .	Juited Stat	212222	Silver ore mining		2015	66		16086	381984		1281417
010000000	5		United Star	21223	Lead are and zinc are mining		2015	. 19		2594	57819		209972
010000000	5	ì	Inited Sta	212234	Cooper ore and nickel ore mining		2015	47		13492	324165		1071445
01000000	s	i	United Sta	21229	Other metal ore mining		2015	54		4072	102792		357879
01000000	5	Ļ	United Sta	212291	Uranium-radium-vanadium ore mining		2015	23		457	10855		40761
01000000	\$		United Sta	212299	All other metal ore mining		2015	31		3615	91937		31/110
01000000	S	l	United Sta	2123	Nonmetallic mineral mining and quarrying		2015	2113		40260	497420		7344919
01000000	5		United Sta	21231	Stone mining and quarrying		2015	2320		3179	30685		150018
01000000	5	1	United Sta	212311	Crushed and broken limestone mining and	c	2015	1452		25432	313757		1468806
010000000	5		United Sta	212313	Crushed and broken granite mining and gu	8	2015	339		5242	70044		326740
010000000	5	i	United Sta	212319	Other crushed and broken stone mining an	d	2015	432		6406	82934		399355
0100000U	5		United 5ta	21232	Sand, gravel, clay, and ceramic and refracto	N.	2015	2307		30364	399216	61214273	1844639
0100000U	9	: 9 J	United Sta	212321	Construction sand and gravel mining	1870 C	2015	2015	8. Se	20509	239191	(N1066))	12352//
0100000U	IS		United Sta	212322	Industrial sand mining		2015	169		5118	82386		163874
0100000U	IS	1	United Sta	212324	Kaolin and ball clay mining	- 1	2015	33		2310	40237		135179
01000000	IS	1	United Sta	212325	i Clay and ceramic and refractory minerals n	ni	2015	280		11194	209757		837248
01000000	S		United Sta	21235	 Other nonmetallic mineral mining and qua Detects and parate mineral mining 		2015	200		3659	86351	L	326574
0100000U	IS 10		United Sta	1 21259.	Descripto rock mining		2015	11		1911	35250	,	149263
01000000	15		United Sta United Sta	1 212392	Conservation of the second se second second sec	et.	2015	36		2409	41822		171490
01000000	15		United Sta	21239	All other nonmetallic mineral mining	5	2015	213		3215	46334	l I	189921
01000000	15		United Sta	21	Support activities for mining		2015	14995		416230	9078386	5	30373279
01000000	ls		United Sta	1 213	L Support activities for mining		2015	1499	i	416230	907838	5	30373279
01000000	JS		United Sta	1 2131	L Support activities for mining		2015	1499	;	416230	907838	;	30373279
01000000	IS		United Sta	1 21311	i Drilling oil and gas wells		2015	2913		89471	207579)	6461492
01000000	JS		United Sta	1 21311	2 Support activities for oil and gas operation	\$	2015	11880) -	314589	678/28	\$	23048171
01000001.	JS		United Sta	1 21311	3 Support activities for coal mining		2015	31		5/28	8/12:	, ,	376053
01000000	JS		United Sta	1 21311	4 Support activities for metal mining		2015	23	,	2620	3581	2	165368
01000000)s		United Sta	ri 21311	5 Support activities for nonmetallic minerals	i (i	2015	201	, ,	24380	58937	5	2115831
0400000)! 	6	California	2	 Mining, quarrying, and on and gas excercing. 	01	2015	25		6021	25173	5	822890
0400000L	<u>15</u>	6	California	21	1 Oil and gas extraction		201	25	,	5021	25173	5	822890
04000000): 6	6	California	2111	1 Oli and gas extraction		2015	25	3	6021	25173	5	822890
04000000	н. Н	6	Californía	21111	1 Crude petroleum and natural gas extraction	n	2015	24	3	5693	23950	2	782354
04000000	J.	6	California	21111	2 Natural gas liquid extraction		2015	; 1)	328	1223	4	40536
0400000	J:	6	California	21	2 Mining (except oil and gas)		2015	26	Э	5736	i 10376	5	421683
04000001	U!	6	California	212	1 Coal mining		201	5	2 a		0	D	
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0400000	Ut	6	California	21211	 Bituminous coal and lignite surface mining 	ç.	2019		2a	1001	U 3088	1	80801
04000001	U!	6	Callfornia	212	2 Metal ore mining		201:	. 1) _	100.	, 2000 D	р	00001
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04000000	U2 1 H	6	Celifornia	21222	1 Gold are mining		201	5 1	5	460	831	5	34263
0400000	UK LIK	6	California	2122	9 Other metal are mining		201	5	11		D	D	
0400000	U:	6	California	21229	9 All other metal ore mining		201	5	1 f		D	D	
0400000	Ús –	6	California	212	3 Nonmetallic mineral mining and quarrying	1	201	5 24	9	471	7 8255	3	339524
0400000	U! .	6	California	2123	1 Stone mining and quarrying		201	5 8	0	127	5 1962	2	10467
0400000	U!	6	California	21231	1 Dimension stone mining and quarrying		201	5 1	1	14:	/ 254	8	24363
0400000	U\$	6	California	21231	2 Crushed and broken limestone mining an	dc	201	5 <u>2</u>	5	49.	D 330	14 15	14806
0400000	0:	6	California	21231	3 Crushed and broken granite mining and q of the second broken stone mining and q	ua	201	5 1	5	42	s 525	5	25382
0400000	102	6	California	21231	b) Sand, gravel, clay, and proken stone mining a local gravel, clay, and ceramic and refract	toi	201	- 4 5 14	õ	188	1 3183	15	142010
0400000	w: MC 1997	6	California	212	1 Construction sand and eravel mining		201	5 1	7.5	169	6 295	i (5)	131482
0400000	ere tale Ut	6 6	California	2123	2 Industrial sand mining		201	5	7	9	9 134	14	5912
0400000	Ú.	6	California	2123	24 Kaolin and ball clay mining		201	5	1 a		Ρ.	D	
0400000	U!	6	California	2123	25 Clay and ceramic and refractory minerals	mi	201	5	5	7	6 8		4186
0400000	U:	6	Californi	212	39 Other nonmetallic mineral mining and qu	arr	201	5 3	9	156	1 310	, n	112500
0400000	NU:	6	i Californii	2123	91 Potash, soda, and borate mineral mining		201	5	4 g		D	D	
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APPENDIX C:

CARB Emission Inventory (Point & Area Source) 2016 Reconciliation Report for EIC 430-422-7078-0000, Sand & Gravel Excavation and Processing Losses

QA_CRI_RECN 10/10/2017

CALIFORNIA EMISSION INVENTORY DEVELOPMENT AND REPORTING SYSTEM II

RECONCILIATION (COUNTY)

PAGE 1

REPORT	- 2016
RECONCILIATION	- DATABASE

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