CALIFORNIA NON-FUEL MINERAL PRODUCTION 2018

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Introduction

California is one of the largest producers of non-fuel minerals in the United States. Non-fuel minerals comprise a variety of commodities produced by mining, but exclude fuel commodities like coal and oil shale. This report summarizes non-fuel mineral mining in California in 2018. It includes production data and trends for a select number of reported commodities. In cases where a small number of mines produced a specific commodity, production is withheld to protect proprietary company information. Production data made available to the public by the mining company is not considered proprietary.

This report is based on annual production data reported to the California Department of Conservation's Division of Mine Reclamation (DMR). All mines regulated under the Surface Mining and Reclamation Act (SMARA) are required to report production annually. In general, mines that will remove at least 1,000 cubic yards of overburden or mineral product, or disturb at least one acre of land, are regulated by SMARA. Since not every small mining operation is regulated by SMARA, there may be a minor amount of production not accounted for in this report.

Based on data from DMR, 739 mines reported production greater than zero. Thirty-four non-fuel mineral commodities were reported to the DMR. These commodities are divided into the following three categories for this report based on the California State Mining and Geology Board (SMGB) Guidelines for Classification and Designation of Mineral Lands (SMGB, 2000):

- Construction materials
- Industrial and chemical mineral materials
- Metallic and rare minerals

This report is organized by these three mineral categories. Commodities that might fall under multiple categories were placed in the category most commonly identified with their end use. For example, pumice may be more commonly used as a construction material but may also be used as an industrial mineral.

Previous California Geological Survey (CGS) Annual Non-Fuel Mineral Production reports were based mostly on data provided by the U.S. Geological Survey (USGS). For 2018, only a limited amount of USGS data were made available to

the CGS (mainly in the form of national average commodity unit prices). The USGS data, relied on for previous reports, are based on surveys of mining operations and includes production data and values for either the mined mineral (e.g., limestone) or an end-use commodity (e.g., Portland Cement). Because the end-use of a mineral is not reported to the DMR, in some cases its value cannot be calculated with the available data. Additionally, because commodities reported to the CGS and USGS do not match in many cases, this report cannot compare 2018 data reported to the DMR with past annual non-fuel reports which were based on the USGS data. This report does not include a total value for mineral production, which was featured in past reports.

Construction Materials

In 2018, construction materials included nine commodities produced by 573 mines. Table 1 summarizes the commodities and production.

Table 1. Construction materials 2018 production summary

Commodity	Number of Mines	Production (short tons)
Cinders	18	446,361
Decomposed Granite	37	957,889
Decorative Rock	18	173,034
Dimension Stone	3	1,622,603
Fill Dirt	25	502,900
Pumice	5	186,335
Rock	37	2,904,001
Sand and Gravel	374	114,885,833
Stone	56	11,072,853

Sand and gravel is produced throughout the state and comprises the majority of construction materials production. California led the nation in the production of sand and gravel in 2018 (USGS, 2020). Sand and gravel production approached 115 million short tons from 374 mines in 2018. The value of sand and gravel was approximately $1.16 billion, based on the USGS estimated national average unit price of $10.08 per short ton (USGS, 2020). Figure 1 shows sand and gravel production trends starting with 1991 (production data was inconsistently reported to DMR in 1990 and is not used in this report). Attachment 1 shows the relative density of sand and gravel mines throughout the state.

Other reported construction materials include cinders, decomposed granite, decorative rock, pumice, and rock. Figure 2 shows production trends of these other construction materials. Data for individual commodities before 1996 were not included to protect proprietary information. Attachment 2 shows the location of mines that produced construction materials other than sand and gravel in 2018.

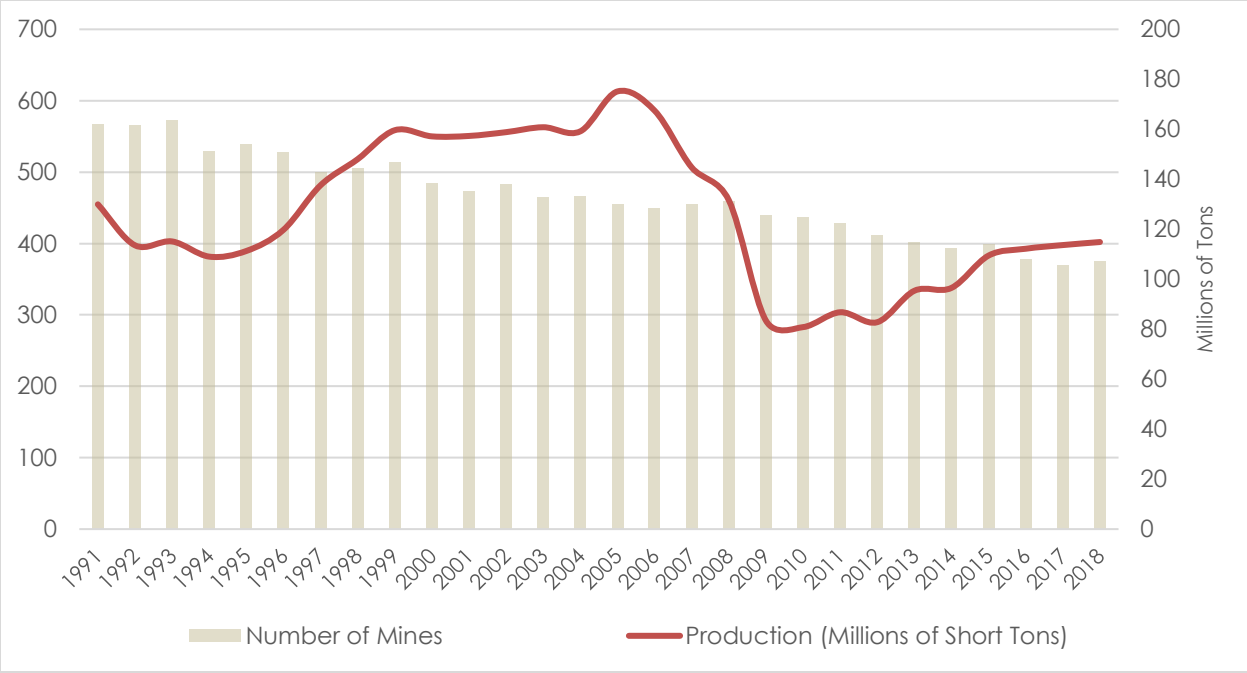

Figure 1. Sand and gravel production trends

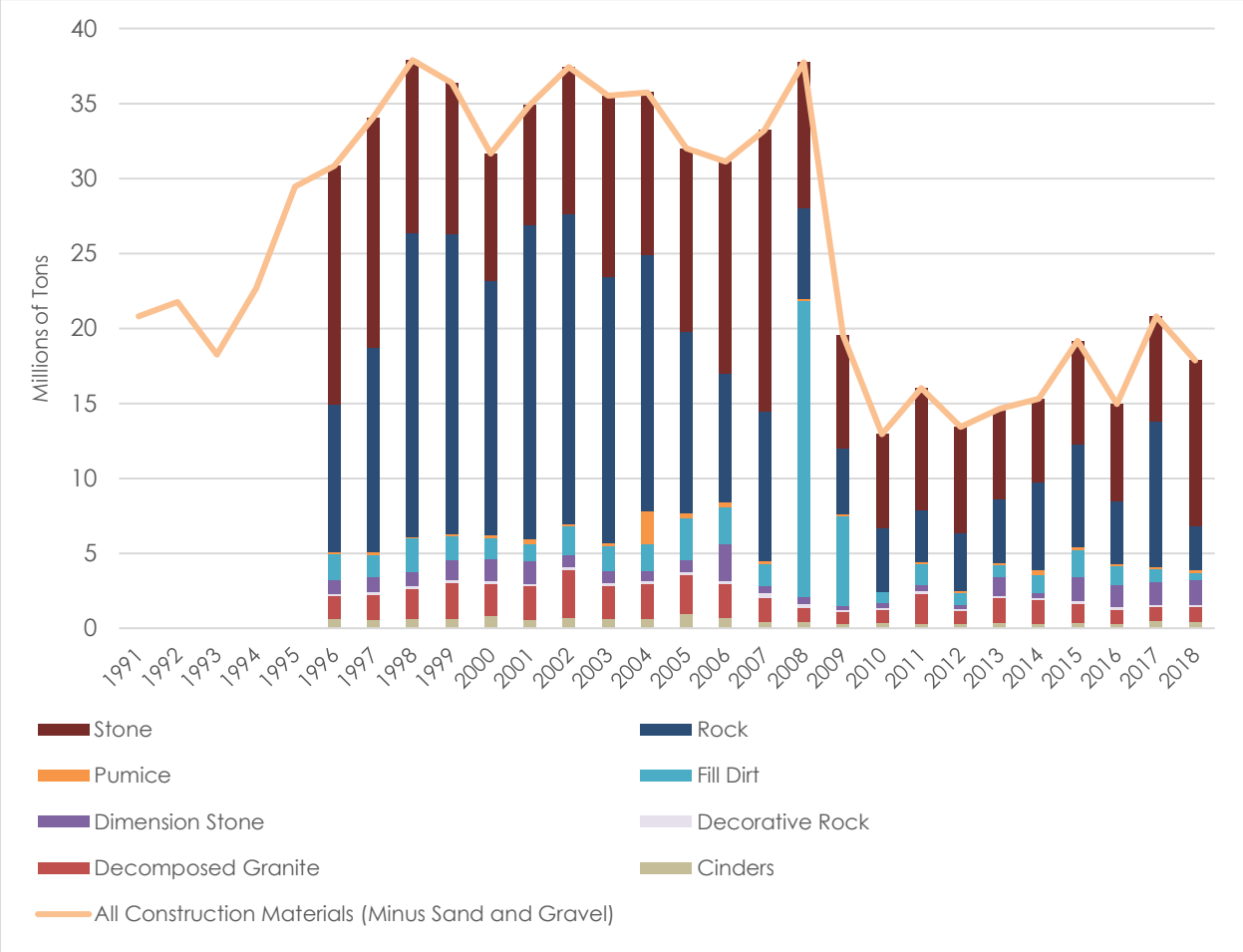

Figure 2. Construction materials (minus sand and gravel) production trends

Industrial and Chemical Mineral Materials

In 2018, industrial and chemical mineral materials included 18 commodities produced by 107 mines. Table 2 summarizes these commodities and the associated production. Attachment 3 shows the location of producers.

Table 2. Industrial and chemical materials 2018 production summary

Commodity	Number of Mines	Production (short tons)
Abrasives	1	W
Borates	2	W
Clay	28	1,034,195
Diatomite	3	384,308
Dolomite	2	W
Feldspar	1	W
Gypsum	6	1,408,230
Lime	1	W
Limestone	28	19,595,243
Saline Compounds	3	1,727,220
Salt	3	4,303
Sea Shells	1	W
Shale	18	730,414
Silica	2	W
Specialty Sand	5	885,012
Talc	1	W
Vermiculite	1	W
Zeolites	1	W

W = Production withheld to protect proprietary information

Limestone production was 19.6 million short tons from 28 mines. Most of the limestone produced in California is used for the manufacture of cement, with the remaining portions produced as crushed rock (a construction material) or as specialty products. The amount of limestone used to manufacture cement is not reported to the DMR; however, according to the Portland Cement Association, California produced 11.3 million tons of cement (Portland Cement Association, 2019). Using the national unit price of $121 per ton provided by the USGS, the total value of cement in California is an estimated $1.37 billion (USGS, 2020). Figure 3 shows limestone production trends.

Gypsum production was 1.41 million short tons from six mines. The value of gypsum was approximately $12.9 million, based on the USGS estimated national average unit price of $9.15 per short ton (USGS, 2020). Figure 4 shows the gypsum production trends.

Specialty sand production was 885 thousand short tons from five mines. Specialty sands are used for applications other than aggregate, including golf course sand traps, beach volleyball courts, and many others.

Borates were produced by two mines including U.S. Borax's Boron Pit, the largest open pit mine in California (U.S. Borax, 2019).

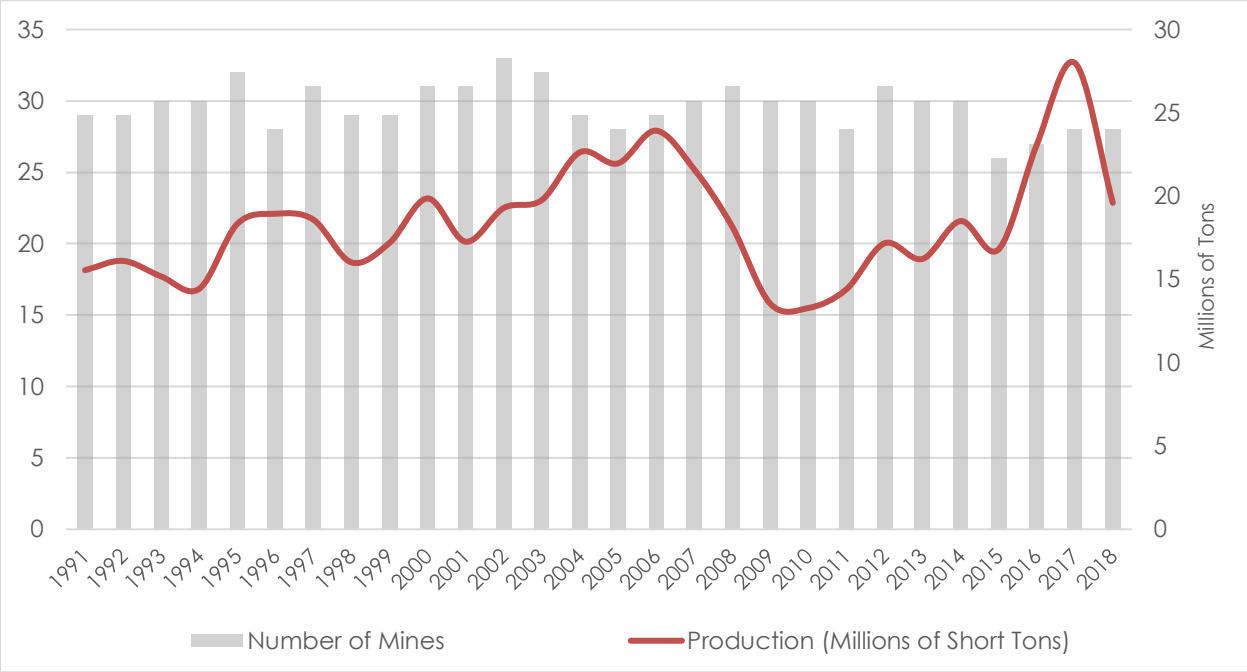

Figure 3. Limestone production trends

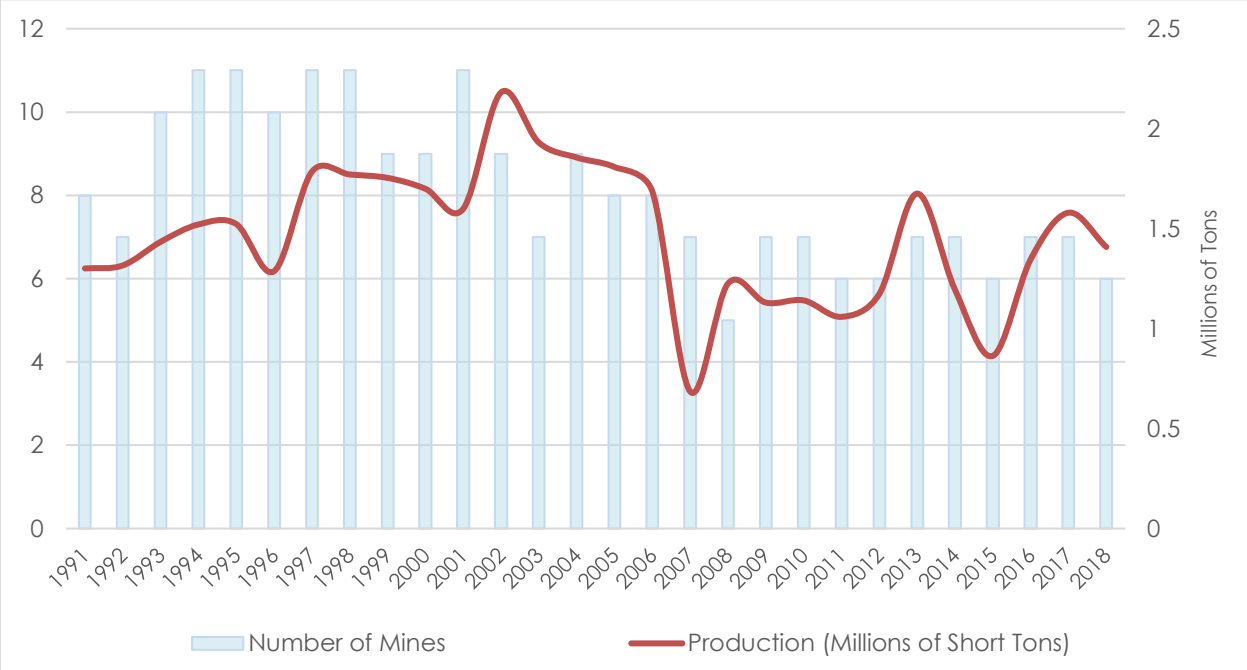

Figure 4. Gypsum production trends

Metallic and Rare Minerals

In 2018, metallic and rare minerals included six commodities produced by 43 mines in the state. Table 3 summarizes the commodities and production. Attachment 4 shows the location of producers.

Gold production was 188 thousand troy ounces from 26 mines, representing a slight production decrease from 2017. The estimated value was $239 million based on an average price of $1,272 per troy ounce (USGS, 2020). The Western Mesquite Mine, an open-pit heap leach mine in Imperial County, led California in gold production. On October 30, 2018, Equinox Gold Corp. purchased the Mesquite Mine from New Gold, Inc. (Equinox Gold Corp., 2020). In addition to mines that produced gold as a primary commodity, 20 construction materials mines produced gold as a secondary commodity. Those mines accounted for approximately three percent of gold production. Figure 5 shows gold production trends.

Silver production was 408 thousand troy ounces from 10 mines, representing a large production increase from 2017. The estimated value was $6.42 million, based on an average price of $15.75 per troy ounce (USGS, 2020). All mines that reported silver production also reported gold production. Figure 6 shows silver production trends.

Iron ore production was 237 thousand short tons from five mines. All primary iron ore production occurred in San Bernardino County.

Rare earth elements were produced at Mountain Pass Mine in San Bernardino County, the only domestic producer. Rare earth concentrate was sold for refinement in China. Mountain Pass Mine is preparing to refine rare earth elements onsite in the future (MP Materials, 2020).

For any questions about this report or the data relied upon, please contact Greg Marquis at (916) 322-9207 or greg.marquis@conservation.ca.gov

Table 3. Metallic and rare minerals 2018 production summary

Commodity	Number of Mines	Production
Gemstones	1	W
Gold (Lode)	5	183,396 troy ounces
Gold (Placer)	21	4,494 troy ounces
Iron Ore	5	237,286 short tons
Rare Earth Elements	1	W
Silver	10	407,559 troy ounces

W = Production withheld to protect proprietary information

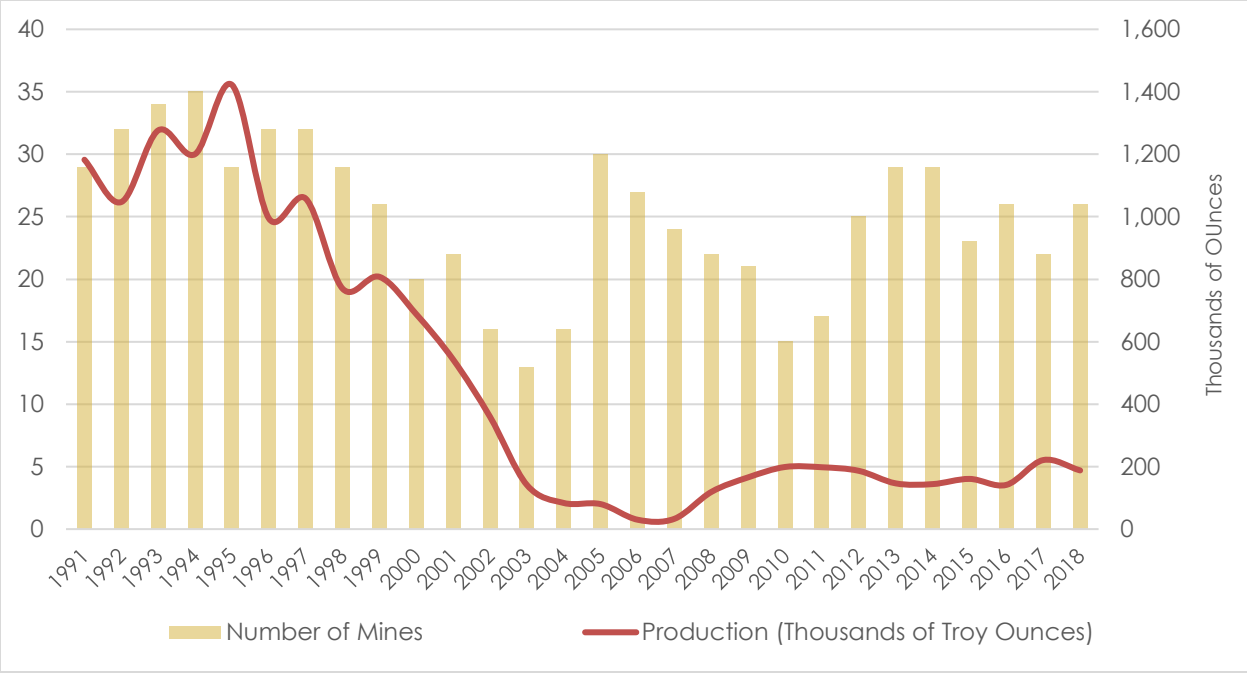

Figure 5. Gold production trends

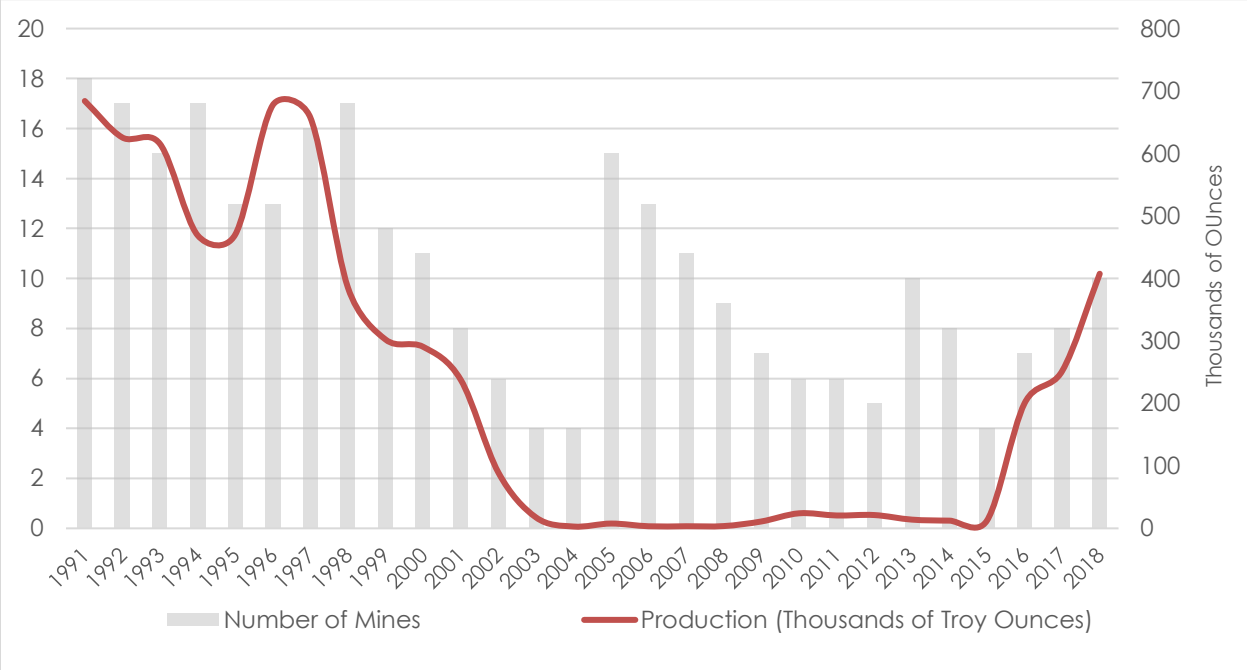

Figure 6. Silver production trends

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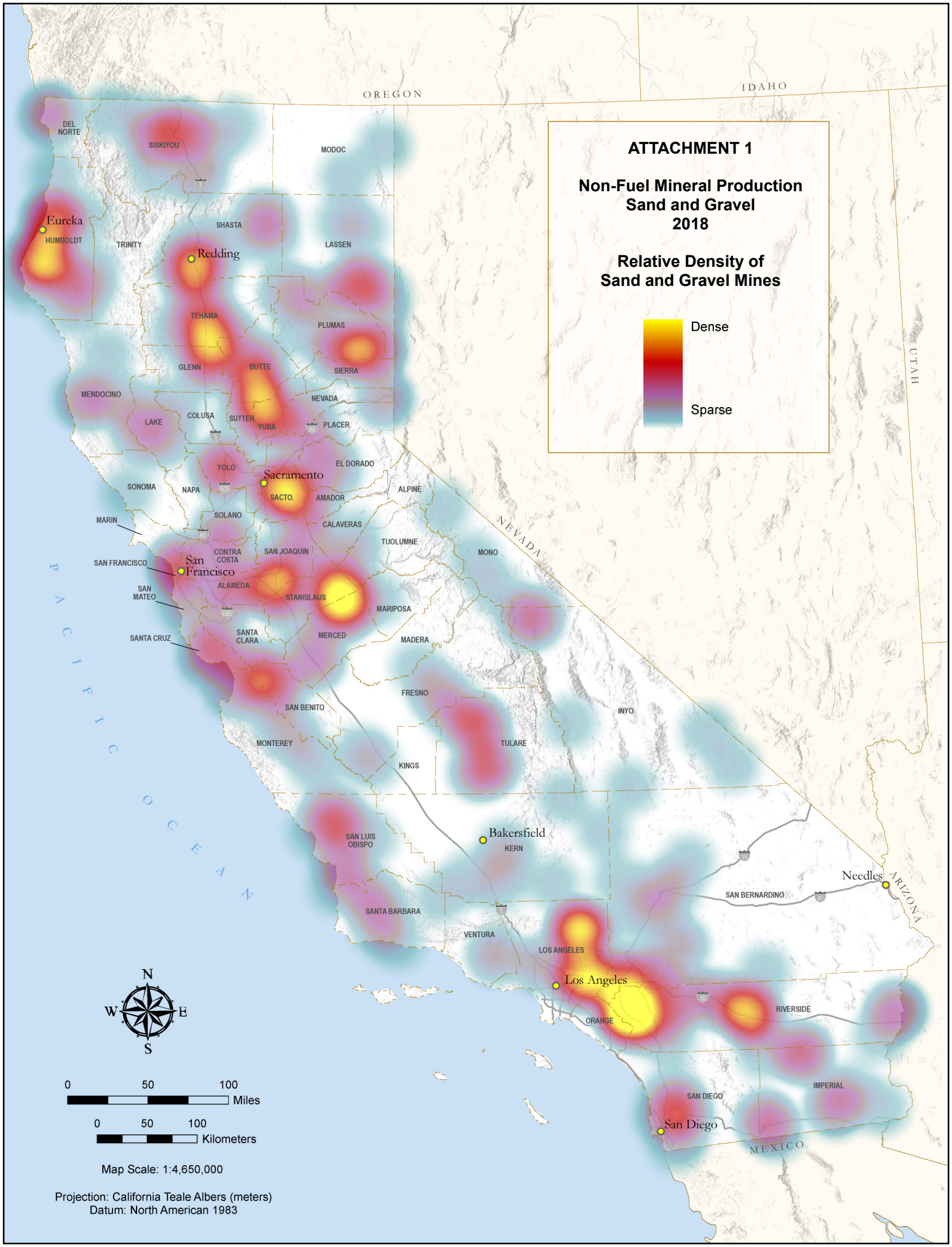
ATTACHMENT 1
Non-Fuel Mineral Production
Sand and Gravel
2018
Relative Density of
Sand and Gravel Mines
Dense
Sparse
OREGON
IDAHO
NEVADA
UTAH
ARIZONA
MEXICO
PACIFIC OCEAN
DEL NORTE
SISKIYOU
MODOC
Eureka
HUMBOLDT
TRINITY
SHASTA
Redding
LASSEN
TEHAMA
PLUMAS
GLENN
BUTTE
SIERRA
MENDOCINO
NEVADA
LAKE
COLUSA
SUTTER
YUBA
PLACER
YOLO
EL DORADO
Sacramento
SONOMA
NAPA
SACTO.
AMADOR
ALPINE
SOLANO
CALAVERAS
MARIN
TUOLUMNE
CONTRA COSTA
SAN JOAQUIN
MONO
SAN FRANCISCO
San Francisco
ALAMEDA
SAN MATEO
STANISLAUS
MARIPOSA
SANTA CLARA
MERCED
MADERA
SANTA CRUZ
FRESNO
SAN BENITO
INYO
MONTEREY
TULARE
KINGS
SAN LUIS OBISPO
Bakersfield
KERN
Needles
SAN BERNARDINO
SANTA BARBARA
VENTURA
LOS ANGELES
Los Angeles
ORANGE
RIVERSIDE
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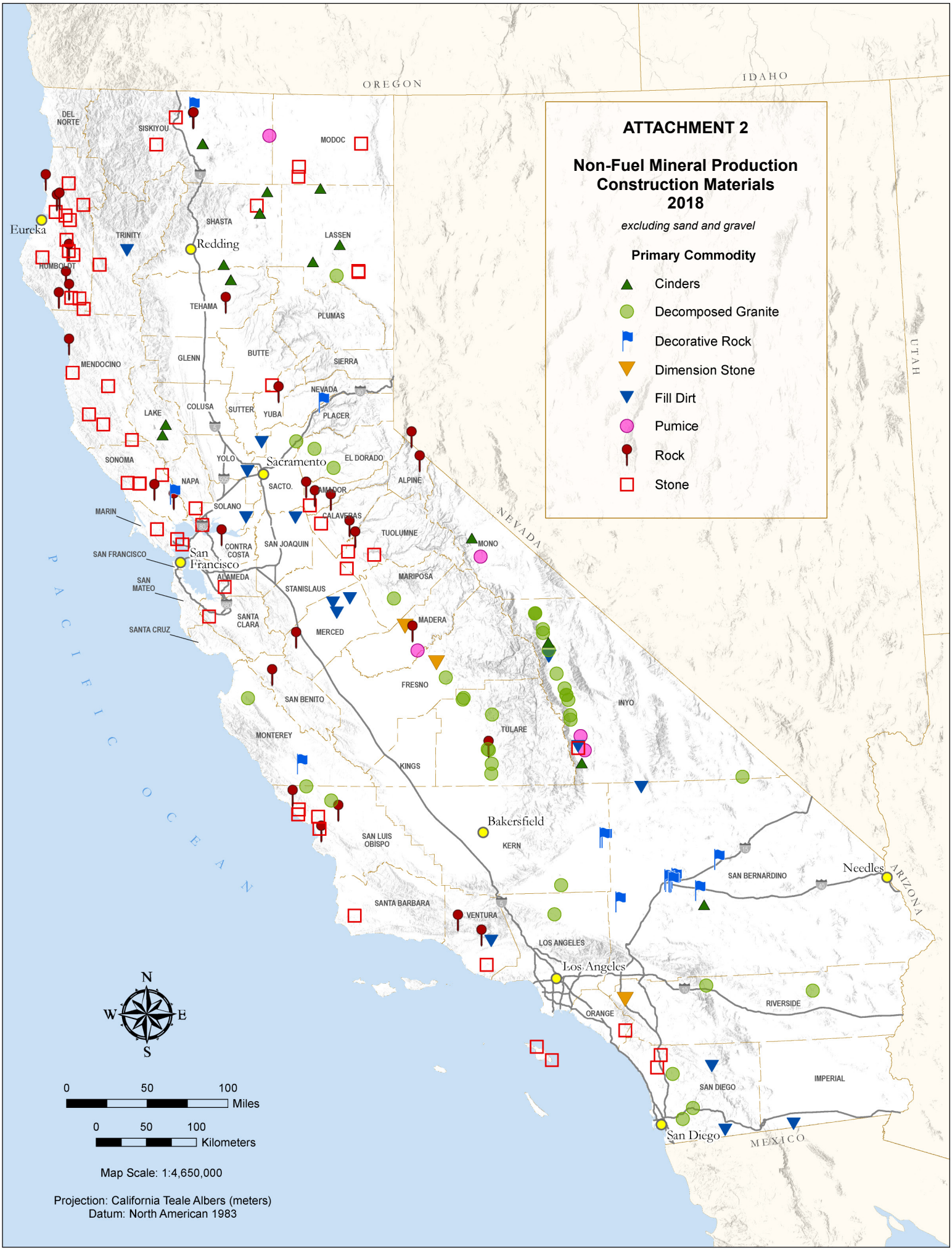
Projection: California Teale Albers (meters)
Datum: North American 1983


ATTACHMENT 2
Non-Fuel Mineral Production
Construction Materials
2018
excluding sand and gravel
Primary Commodity
Cinders
Decomposed Granite
Decorative Rock
Dimension Stone
Fill Dirt
Pumice
Rock
Stone
OREGON
IDAHO
NEVADA
UTAH
ARIZONA
MEXICO
PACIFIC OCEAN
DEL NORTE
SISKIYOU
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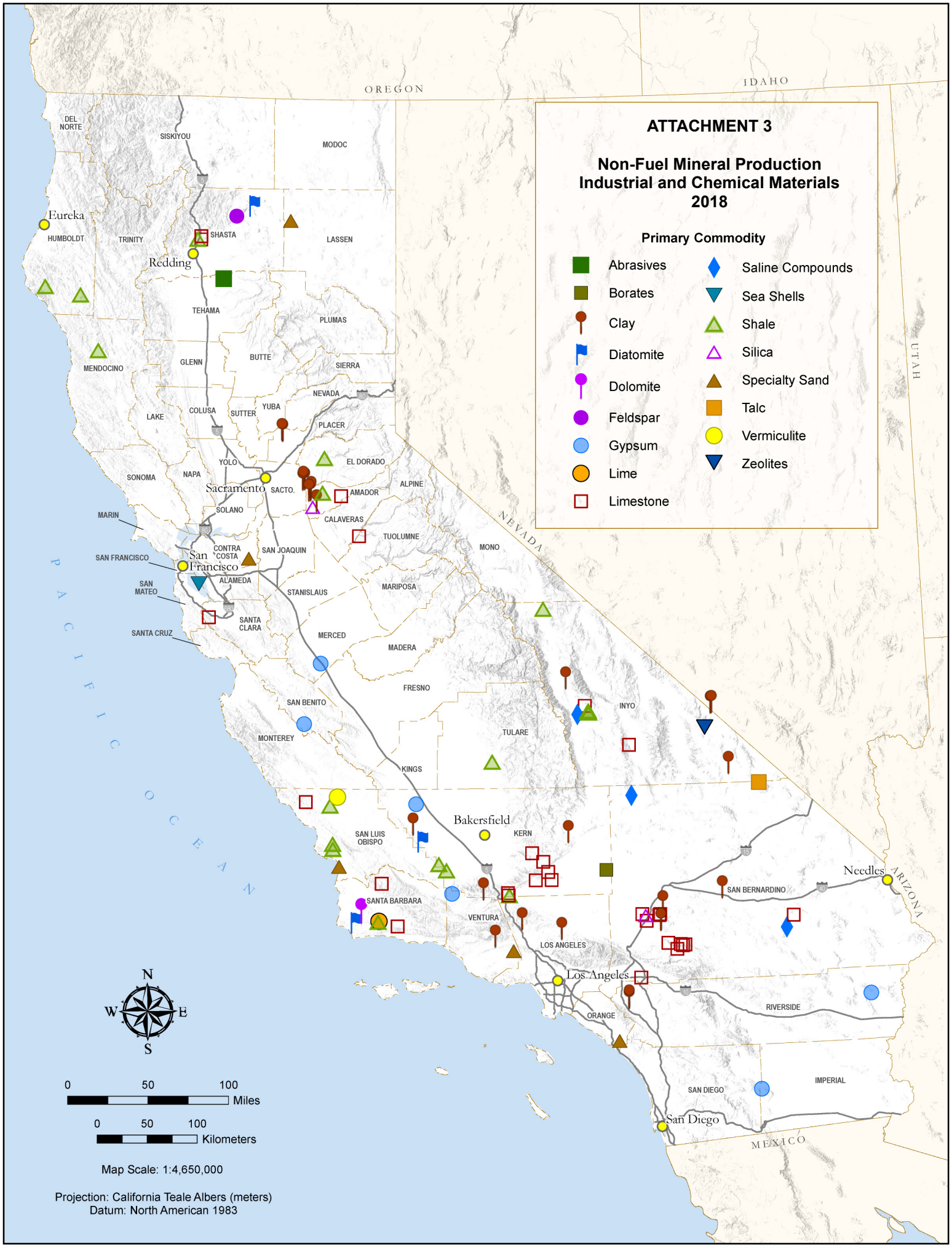
ATTACHMENT 3
Non-Fuel Mineral Production
Industrial and Chemical Materials
2018
Primary Commodity
Abrasives
Borates
Clay
Diatomite
Dolomite
Feldspar
Gypsum
Lime
Limestone
Saline Compounds
Sea Shells
Shale
Silica
Specialty Sand
Talc
Vermiculite
Zeolites
OREGON
IDAHO
NEVADA
UTAH
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MEXICO
PACIFIC OCEAN
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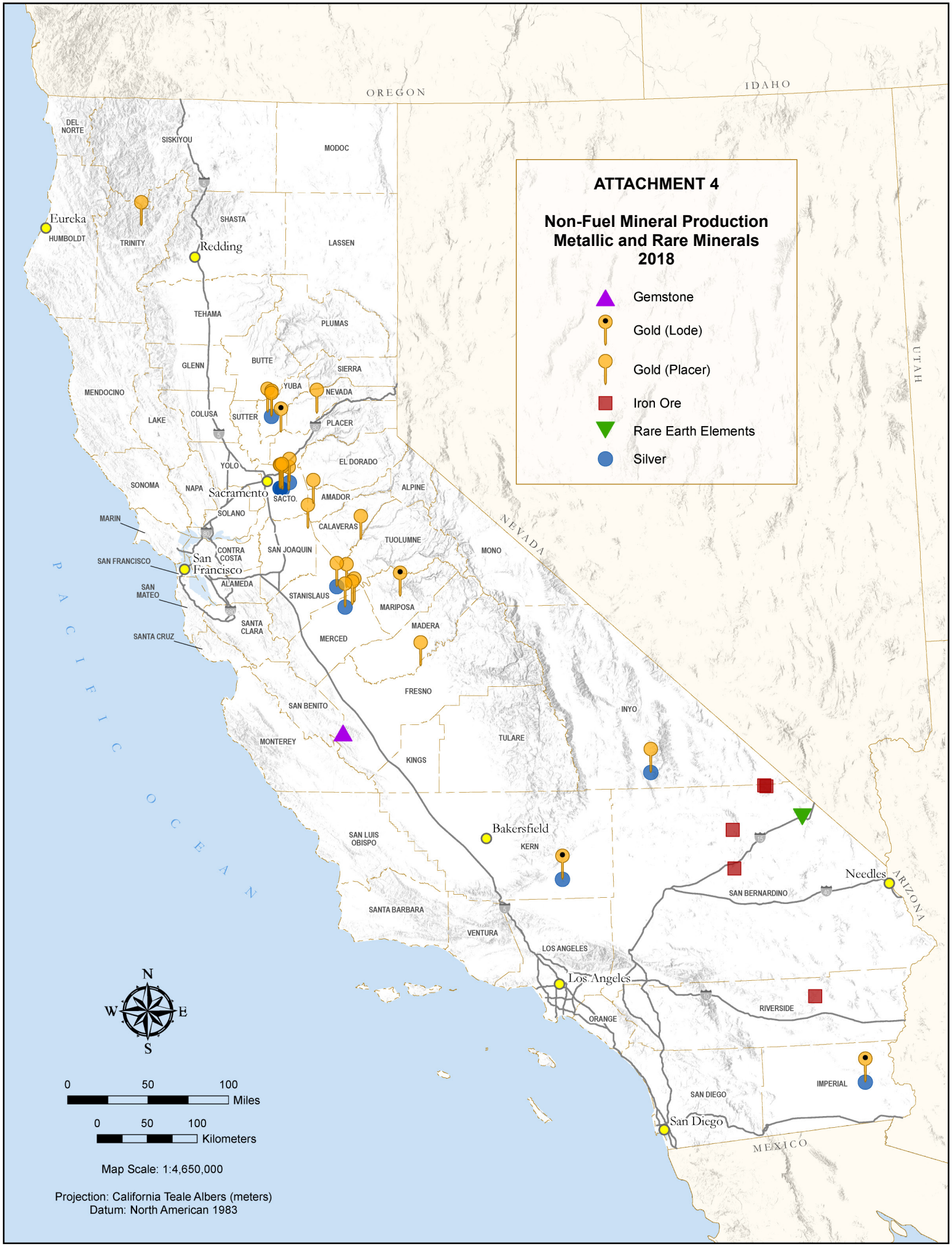
ATTACHMENT 4
Non-Fuel Mineral Production
Metallic and Rare Minerals
2018
Gemstone
Gold (Lode)
Gold (Placer)
Iron Ore
Rare Earth Elements
Silver
OREGON
IDAHO
NEVADA
UTAH
ARIZONA
MEXICO
PACIFIC OCEAN
DEL NORTE
SISKIYOU
MODOC
HUMBOLDT
TRINITY
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