Chapter 3
GEOLOGICAL CONDITIONS

The alternatives discussed in this appraisal report cover a large area of about 200 miles (north to south) by 160 miles (east to west) (figure 10). The options extend from the Salton Sea north to immediately northeast of Riverside, California; northeast about 50 miles to Palen Dry Lake; east about 70 miles to the Imperial Reservoir on the Colorado River; west about 90 miles to the Pacific Ocean for two options to Oceanside and San Diego, California; and to the south where there are two options 120 and 160 miles to the Gulf of California in Mexico. As would be anticipated, geologic conditions vary greatly.

A general geologic description for the alternatives is included in table 5. An appraisal level geologic report has been prepared for the Palen Dry Lake area. This report can be obtained by contacting Salton Sea Project Manager Bill Steele, Bureau of Reclamation, PO Box 61470, Boulder City, NV 89006; phone (702) 293-8129.

As proposed in this appraisal report, there are a variety of features, such as embankments, tunnels, canals, pumping plants, pipelines, etc., that are affected by the geologic conditions. From an engineering geologic point of view, all of the features that comprise the various alternatives can be designed and constructed.

As shown in table 5, most of the alternative alignments cross faults. Figure 11 shows the seismicity magnitude greater than 3 for the area around the proposed options. The Salton Sea area is one of the most seismically active areas in California, if not the world. Table 6, from the Seismotectonic Evaluation for the Salton Sea Project, Southern California, shows pertinent data on the specific faults in the Salton Sea area. Design and construction to incorporate the faulting and seismicity cannot preclude potential damage to the proposed features. Any damage due to faulting and seismicity would cause operational and maintenance problems and would require additional design and construction activities.

Table 5.—Appraisal level geologic description for the Salton Sea alternatives

Facilities	Geologic materials
Concentration pond(s) at southwest shore, two dikes at the Salton Sea	Quaternary lake deposits.
Enhanced evaporation system and concentration ponds, adjacent to the Salton Sea	Recent lake deposits, alluvium, and dune sand; Pleistocene nonmarine sediments; and Tertiary lake deposits. Bombay Beach area is on the San Andreas Fault zone.
Routes to the Gulf of California, Golfo de Santa Clara, and San Felipe	Recent lake deposits, alluvium, and dune sand; and Pleistocene nonmarine sediments.
Routes to the Pacific Ocean, San Diego, and Oceanside	Quaternary alluvium, Pleistocene nonmarine sedimentary rocks, and Mesozoic granitic and metamorphic rocks. Crosses San Jacinto, Caliente, and Elsinore Fault zones.
Route to Palen Dry Lake	Recent lake deposits, alluvium, and sand dunes; and Pleistocene nonmarine sediments. Crosses the San Andreas Fault zone.
Routes from Imperial Dam via Coachella Canal and the All-American Canal to the Salton Sea	The route paralleling the All-American Canal leads to the Alamo River. On Recent lake deposits, alluvium, and dune sand. Most of the Coachella Canal alignment parallels and eventually crosses the San Andreas Fault zone. The All-American Canal crosses the San Andreas Fault zone.
Route from San Bernardino to the Salton Sea	Minor Mesozoic granitic and shallow intrusive rocks. Mostly Recent lake deposits and alluvium. Begins on and parallels San Andreas Fault zone.

Table 6.—Fault sources—Salton Sea study area

Seismic source	Length (miles)	M_{Max}	Characteristic displacement (feet)	Recurrence interval (years)
San Andreas-Coachella Valley and San Bernardino	68-124	7.4 -7.7	18 +/- 3.2	220
Imperial	40-43	7.0	6.6 +/- 3.2	80
San Jacinto-Superstition Hills	14-22	6.6	3.2 +/- 1.0	250
San Jacinto-Superstition Mountains	14-19	6.6	6.4 +/- 1.0	340
San Jacinto-Borrego Mountain	15-19	6.6	2.3 +/- 0.3	175
San Jacinto-Anza	56	7.3	9.8 +/- 3.2	250
San Jacinto-Coyote Creek	25-29	6.9	2.3 +/- 1.0	175
Cerro Prieto	74	7.5	9.8 +/- 3.2	120
Elsinore-Julian	46-50	7.3	5.6 +/- 1.0	340
Elsinore-Coyote Mountain	24	6.9	8.2 +/- 1.6	625
Laguna Salada	43	7.0	11.5 +/- 3.2	1,000
Algondones	43	7.2	13.1 +/- 1.6	8,000

Note: $\mathbf{M_{MAX}}$ = Maximum moment magnitude inferred for fault segment.

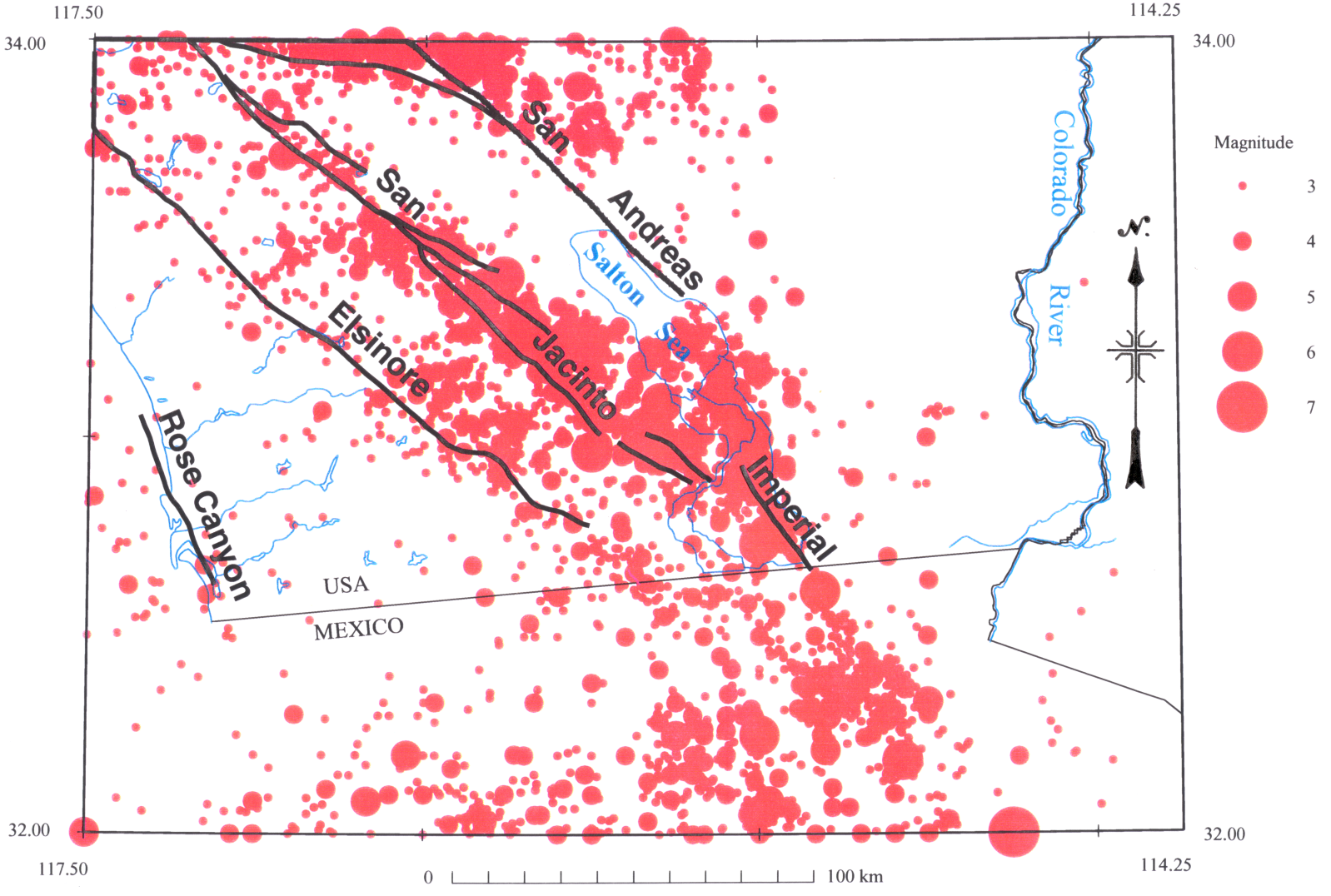

Figure 11.—Seismicity of magnitude 3 and greater, 1932-1998, in Salton Sea study area. Major fault zones shown by heavy black lines.