

# California's geo regulators have different concerns

**Editor's note:** Last month, the Tribune-Herald's geothermal reporter, Dave Harada-Stone, travelled to Southern California to see several geothermal plants and how they've fit in with their surrounding communities. Besides touring the plants, Harada-Stone also met with local officials to see how the promises made when geothermal development was first proposed have jibed with the reality. The following is the second in a three-part series.

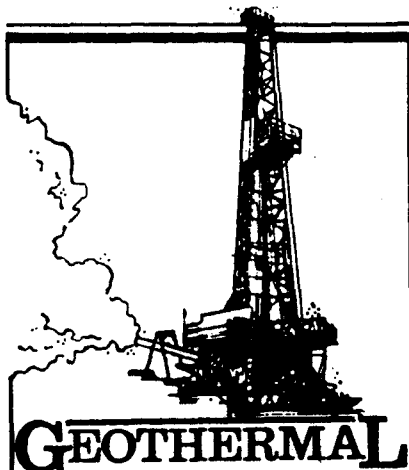
By Dave Harada-Stone  
Tribune-Herald

**SALTON SEA, Calif.** — This saltwater lake in the northern Imperial Valley is a tribute to the ability of humans to radically alter their environment — sometimes in ways they never foresaw.

At 374 square miles, the Salton Sea is the largest lake in California and the 10th largest in the United States (not including the Great Lakes). It is also an accident.

The lake was created near the turn of the century when engineers fiddling with the flow of the Colorado River diverted its waters, thus filling the trough, 227 feet below sea level, that was to become the Salton Sea.

Today, the sea is regarded as a recreational resource and parts



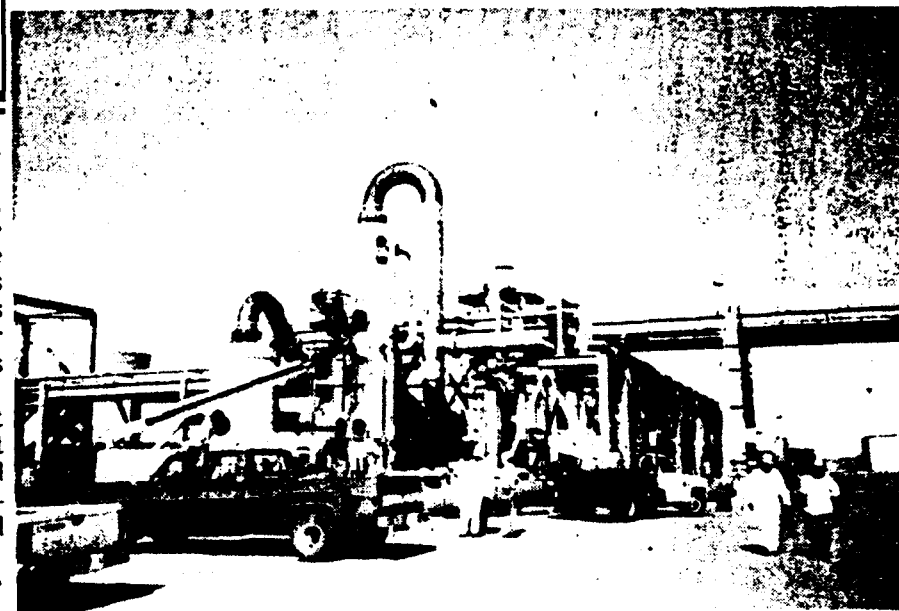
## The record in Southern California

of its banks are protected as a wildlife preserve.

The lake's southeast shore, meanwhile, is the site of the largest geothermal field in the valley, with six power plants generating nearly 200 megawatts of electricity to meet the power demands of the Los Angeles area.

State regulators recognize that not all of man's mistakes turn out as well as the Salton Sea did, and they say they're working full-time to make sure geothermal

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—T-H photos by  
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**SEASIDE** — The Salton Sea, above, was created by accident early in the century when crews inadvertently diverted the waters of the Colorado River. Six geothermal plants are now on its shores. At left, Unocal's Salton Sea Unit 3 facility.

# GEOHERMAL: Valley has different woes

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development here doesn't produce another environmental surprise.

The valley's geothermal developments have escaped the principal environmental curse of similar projects elsewhere, namely hydrogen sulfide. The noxious gas has an odor like that of rotten eggs and, at high enough levels, can cause eye and respiratory distress. At extremely high levels, hydrogen sulfide can cause death.

At the HGP-A facility in Pohoiki, hydrogen sulfide emissions prompted numerous complaints by nearby residents. Their experience has contributed significantly to the skepticism amongst Puna residents about the environmental promises made by Ormat Energy Systems, developer of the 25-megawatt Puna Geothermal Venture project in Pohoiki, and other developers.

In the valley, however, emissions have simply not been a problem, according to Harry Dillon of the Imperial County Air Pollution Control District.

"You can smell it if you get right up on the plants' cooling towers, but not at the fence line," he said. "And our plants are pretty isolated."

Even without much effort at abatement, Dillon said, the valley's plants have no problem meeting California's ambient hydrogen sulfide limit of about 30 parts per billion, even with little or no effort at abatement.

A look at the numbers will indicate why.

Dillon estimates the hydrogen sulfide concentrations in the valley's resource at about 25 parts per million. Compare that with the Geysers field in Northern

California, where the gas has sometimes been a problem, at 200-to-1,000 parts per million, and Hawaii, where composite data from the HGP-A well and three commercial test wells in Pohoiki put the hydrogen sulfide content at between 800 and 1,300 parts per million.

Hawaii developers have looked at a number of ways of dealing with hydrogen sulfide. Ormat, whose plant is due to begin coming on line later this year, is taking a cue from geothermal development at Coso, Calif., north of the Imperial Valley, where developers have had success with reinjecting hydrogen sulfide and other non-condensable gases — including carbon dioxide — along with geothermal fluids into the underground reservoir.

But hydrogen sulfide is not all there is to worry about.

According to Paul Sweeny, geothermal project manager for the California Regional Water Control Board, geothermal development in the valley poses a major challenge in the management of solid and liquid wastes.

"The voluminous amounts of wastewater and solid wastes that are generated by the industry must be managed to prevent any adverse impacts to ground waters, surface waters, farmland, federal lands and biologically sensitive areas," he said.

A few of the threats to water quality, according to Sweeny: drilling muds and fluids, including chemical drilling additives; injection wells, injection and production well sump ponds used to contain geothermal fluids when reinjection is not possible; cooling tower chemicals; filter

residues and drill cuttings; radioactive solids in the waste; and the landfills at which the wastes are stored.

Sweeny estimated the valley's geothermal plants generate 145 tons of solid waste and more than 84 million gallons of liquid waste a day, with most of the latter being reinjected into the underground geothermal reservoir.

Aside from inert drilling muds and cuttings, the solid waste includes tons of filter cake extracted from the highly saline geothermal brines of the Salton Sea area. Though mostly silica, the material includes low concentrations of arsenic, lead, mercury and other potentially toxic substances and thus is treated as hazardous.

Regulators are also concerned about low levels of radioactivity in the filter cake. Although they do not regard the material as a threat to public health and safety, officials have advised state inspectors to limit their exposure to the substance and to wear respirators and protective clothing when in portions of geothermal facilities where bits of the filter cake may be airborne.

Some of the solid waste from the facilities is mixed with other materials to form a "geocrete" used to pave roadways and other surfaces on-site. The rest is disposed of at a state-approved landfill operated by GSX Services Inc. A proposal is pending by a subsidiary of Magma Power Co., which operates four plants in the Salton Sea area, for a dedicated "monofill" to receive wastes from the plant.

The filtration that produces the cakes is made necessary by the high content of dissolved solids in

the Salton Sea resource, which at up to 300,000 parts per million of total dissolved solids has five times or more the dissolved solids of Hawaii's geothermal resource.

The hot brines that fuel the valley's geothermal plants also present a waste management problem, according to Sweeny. The brines are highly corrosive, and most plant operators have had to report major spills, some running into the thousands of gallons.

The salt-laden hot water kills whatever it touches, Sweeny said, forcing the plants' operators to occasionally have to reimburse farmers for damaged crops.

"We also make them scoop out all contaminated soil and replace it," he said.

Corrosion and scaling can also cause failures of the well casings that are supposed to protect ground water from contamination by geothermal fluids. Sweeny noted that an injection well at a Chevron facility in Heber, Calif. suffered such a casing failure recently.

Asked if he had any advice for Hawaii officials who will be charged with regulating geothermal development, Sweeny said vigilance is the key.

"You really have to keep a keen eye on these operators on an almost daily basis," he said. "It's very easy for them to say, 'that was only a few hundred gallons (of brine) we spilled,' but when you add it all up, cumulatively, it can be quite an impact."

**Tomorrow: How long will Imperial Valley's geothermal resources last?**