SALTON SEA BARRIER-CURTAIN PROJECT

PREPARED AND PROPOSED BY

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GENERAL BACKGROUND

The 35 mile long Salton Sea is located at the North end of the Imperial Valley in Imperial and Riverside Counties. For the past several decades, the concerns about increasing elevations at the Salton Sea have been linked to increased agriculture run-off, above-average rainfall from 1976 through 1983, and increasing waste water flows from Mexico. The salinity of the Salton Sea is becoming a problem and has recently gained the attention of local, state and federal officials, especially with the emphasis on increasing water conservation.

The Sea was formed in 1905 when the Colorado River broke through a diversion canal built by the California Development Company. For nearly two years, water from the Colorado flowed unimpeded into the Salton Sink, the desert region lying as much as 278 feet below sea level. Before the break in the canal could be repaired, the river had created the largest lake in California. Since the initial flood of Colorado River water, the Salton Sea has been sustained by agricultural drainage from the Imperial, Coachella and Mexicali Valleys, rainfall, storm run-off from the surrounding mountains and ground water inflow. Because the Sea exists in a closed basin, the only outflow is evaporation.

ELEVATION

After the Colorado ceased flowing into the Salton Sea in 1907, evaporation greatly exceeded inflow and the water level rapidly declined until 1924. Increased development of irrigation, improvement of agricultural drainage systems and several major rain storms caused inflow to exceed evaporation, which had resulted in a gradual and continual annual rise in the Sea until 1980. After that the elevation stabilized somewhat, due largely to IID's water conservation programs.

In 1907, when the Sea reached its highest level in this century, it covered more than 300,000 acres and contained approximately 15 million acre-feet of water. Today, the surface area covers about 245,000 acres with about 7 million acre-feet of water.

SALINITY

In 1989 the IID and Metropolitan Water District of Los Angeles signed a conservation agreement that could lower the Sea by two feet over the next 35 years.

Paradoxically, the Salton Sea also boasts a sport fishing industry that is threatened by the lowering of the Sea's elevation. Because the Sea is a terminal sea, all the salts which drain from the surrounding agricultural lands of the lower Colorado River and Mexico are deposited there. The high evaporation rate of the desert climate removes water from the Sea each year, but leaves the salt behind to become more and more concentrated. Therefore, any reduction in the water flowing to the Sea causes a rise in the salinity of the water in the Sea.

Currently, the salinity level of the Salton Sea is more than 40,000 ppm, which exceeds the salinity of ocean water which is about 35,000 ppm.

POLLUTION

The Sea is also impacted by the effects of pollution flowing in through the New River. As an open conduit for untreated sewage, heavy metals contamination and pesticide residue from Northern Mexico, the New River is a major and difficult to control problem beginning to affect the Salton Sea.

SELENIUM

Selenium, the element blamed for water-fowl deformities at the Kesterson Reservoir in Merced County, California, has been detected in Salton Sea fish in concentrations that sometimes exceed state advisory levels. Although warnings have been issued on consumption of Salton Sea fish, information on selenium is still being collected and analyzed. Selenium levels in the Sea itself remain at levels comparable to ocean water.

STABILIZING THE SEA

In 1986, a group of 20 interested agencies formed the Salton Sea Task Force, with the goal of finding a workable plan to stabilize the elevation and salinity of the Salton Sea. The Task Force is organized under the California Resources Agency and has the official approval of the Governor of California.

The source for the information recited above was taken from the Public Information Office of the Imperial Irrigation District.

PROPOSED PROJECT FOR REDUCING THE SALINITY IN THE SALTON SEA

We all agree that there is a need to reduce the salinity in the Sea and several proposed solutions have been considered of which the most seriously considered will take fifteen years to stabilize the salinity and another 50 years to reduce it to that of the ocean. It also requires the expenditure of over one hundred million dollars.

Our proposal is really two proposals using the same method but in different ways. The first was made in 1992 but it had one major disadvantage. It would make the South half of the sea less salty but would make the North half very salty, which is good for those that live in the South but very bad for those in the North. It contained the following:

It would not save the entire Sea but it would reduce the salinity in 50.3% of the Sea to below that of the Pacific Ocean in less than five years and at a cost that would have saved about 98.5% of the cost of the other major proposals.

This first proposal was based on certain facts which are:

1. There is an evaporation rate of 5.76 feet per year and which approximately equals the inflow of water, most of which comes from the Southern end of the Sea

2. The inflowing water which mainly comes from the Alamo and New River has a salinity of 2460 ppm and that the Sea is currently approximately 40,000 ppm or more.

3. That if a dam was constructed so as to divided the Sea in approximately half (50.3% in the South half and 49.7% in the North) The dam length would be approximately 9 miles.

4. That since most of the inflow is from the South there would be a constant flow through the dam from South to North.

5. That this dam would make two seas out of the Sea, one of which would become more salty and one that would over a period of five years become less salty than the Pacific Ocean. The salinity could actually be regulated at any point between 8000 ppm to that of ocean water which is 37,500 ppm simply by letting more of the North half mix with the South half.

6. This dam would not have any appreciable pressure on it since one side would have almost the same elevation as the

other provided a one-way outlet would allow the excess water from the South side to flow to the North side.

OUR PROPOSAL was the installation of a High Density Polyethylene dam or curtain across the Salton Sea that would be located just South of the narrowest part and just North of Bombay Beach that would leave 50.3% of the Sea in the South half.

This polyethylene material is practically indestructible by Ultra Violet light and other chemicals found in the Sea including salt. In fact the manufacturer who has already produced over a billion square feet will guarantee it for 20 years but it is expected to last much longer.

The curtain will be so placed that it will protrude up above the surface by a few inches so that the majority of the wave action will not break over the top. On the bottom the barrier curtain will be anchored by filling a tube made out of the polyethylene with a cement slurry so that it will be approximately 95% water tight. However, there will be several one-way gates that will allow the water to flow from the South end to the North end.

PROPOSAL TWO
SALT CONCENTRATION LAKES

The salt concentration lakes work in a similar manner as the barrier-curtain except in reverse. Lakes within the Sea would be constructed of the same material in that the lake or lakes would simply pond certain portions of the Sea instead of a barrier dividing the Sea. This method would be more expensive in that it would take more miles of barrier-curtain to surround a body of water equal to the 47% of the Sea that could be divided with only 8 miles of barrier-curtain.

Of course it would not be necessary to pond into lakes 47% of the Sea. It could be done with 25% but then it would take twice as long to reduce the salinity.

CONSTRUCTION OF A LAKE OR LAKES WITHIN THE SALTON SEA

The construction of a circular barrier-curtain so as to form an enclosure or lake or pond would be done in the following manner:

1. The polyethylene has to be welded together in order to form a continuous barrier. In addition there has to be a welded tube both at the top and at the bottom. The tube at the top would be filled with some light material, such as Urethane, Styrofoam or just air, that will act as a float. High density polyethylene already has a density of .98 which means it does barely float on it own. A 6" to 12" splash guard made from the

same material will reduce the exchange of water from coming in over the top. This system is not intended to be water tight but just to reduce the exchange of water.

2. Almost all of the welding will be done on shore including the insertion of the urethane or styrofoam in the top tube and the welding of the bottom tube which will be about 12" in diameter. As the welding is being completed the barrier will be floated out into the Sea. As each portion is floated into place, the bottom tube will be filled with cement, which will hold the curtain in place and will not allow it to move even if there is a violent storm. This last process will be done with a cement pump mounted on a barrage.

3. As the curtain is put into place and the lower tube filled with cement, there will be an equal amount of curtain that has not been filled with cement trailing back to shore. This means that when the first half of the curtain has been put into place and filled with cement, the welding on the second half will have been completed.

4. A one way flapper valve or gate will be installed so that water may enter the lake area but not leave.

5. Economically it would be better to use the shallow portions of the Sea to install the lakes in but this of course would be near the shore and that might not be desirable from the users point of view. The barrier-curtain lake could be placed in the center of the Sea in the deeper parts but this would require more material and more welding. The reduction of salinity is based on surface area not water volume, because it is the evaporation from the surface that makes this system work.

SUMMARY AND COMPARISON OF THE TWO PROPOSED METHODS

Each of the two proposals have their strong points and weak points which we will try to summarize here:

1. The barrier-curtain through the middle of the Sea is by far the most economical. It would require only 8 miles of curtain and would reduce the salinity in three years to below that of the Pacific Ocean. However, the Northern half would become a dead Sea in a very short time.

2. The lake within the Sea would allow the prime portions of the Sea to become less salty but would cost twice to four time as much as the barrier-curtain proposal.

3. Either method is much more practical than the other proposals that I have examined. The diking method, although similar, would be much more costly.

PILOT INSTALLATION OF BARRIER

CONCLUSION

Using this method of reducing the salinity in the Salton Sea, has certain advanages which are:

1. This method is very inexpensive when compared with the other proposals.

2. A barrier-curtain lakes can be installed in a relative short time, 18 months, and, depending on the size of the lakes, could reduce the portion of the Sea outside the lakes to below that of Pacific Ocean water in 3 to 5 years instead of 50 years.

3. The material in the barrier is guaranteed for 20 years against deterioration from Sun light and anything that is found in the Sea except of course power boats.

4. Because of the short time required to lower the salinity, the sport fishing industry will be saved whereas the other methods do not happen fast enough. With 20 million dollars a year being spent on sport fishing, this aspect needs serious consideration.

A patent is being applied for through the U.S. Patent Office.

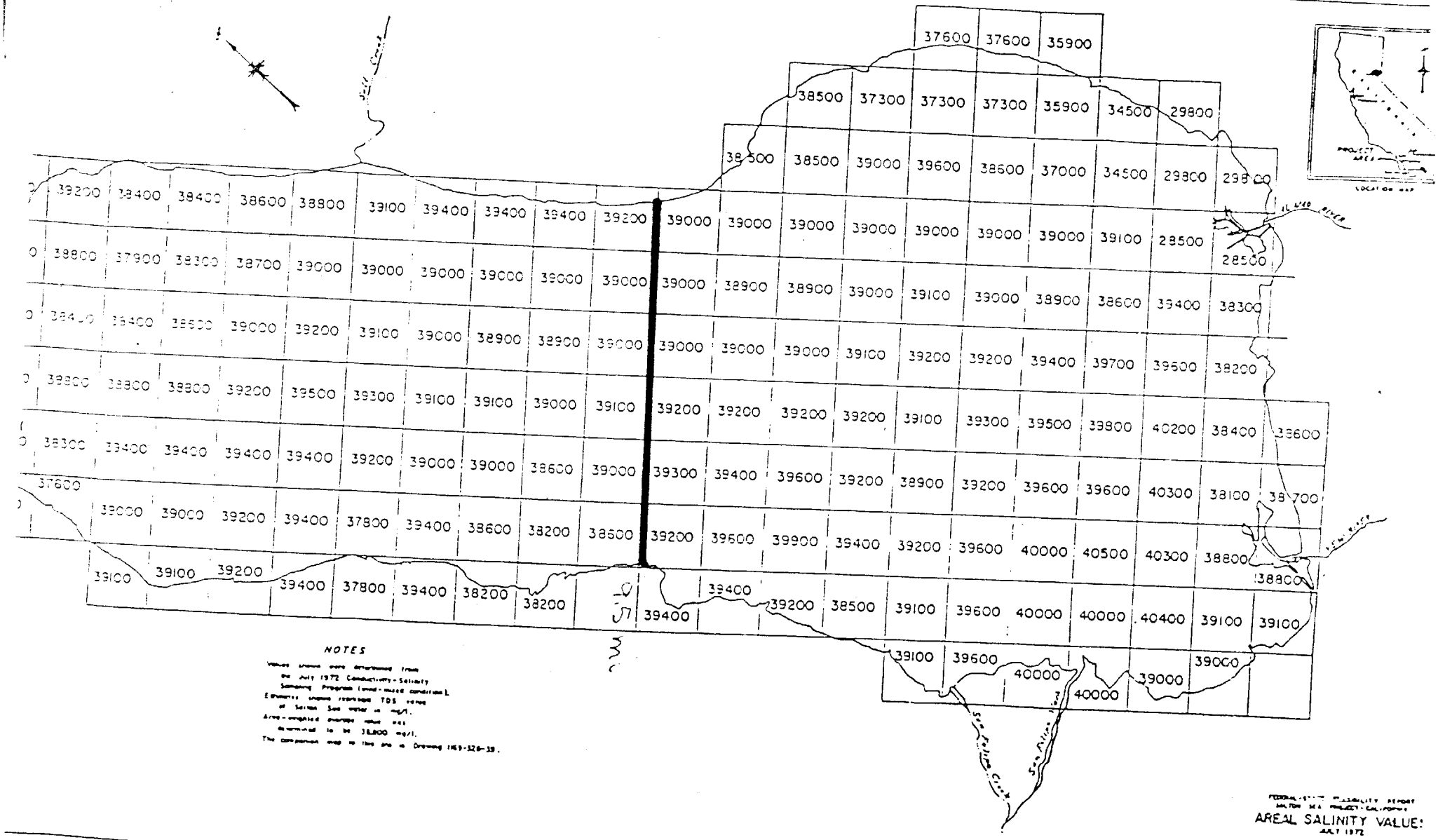

FIGURE C-3

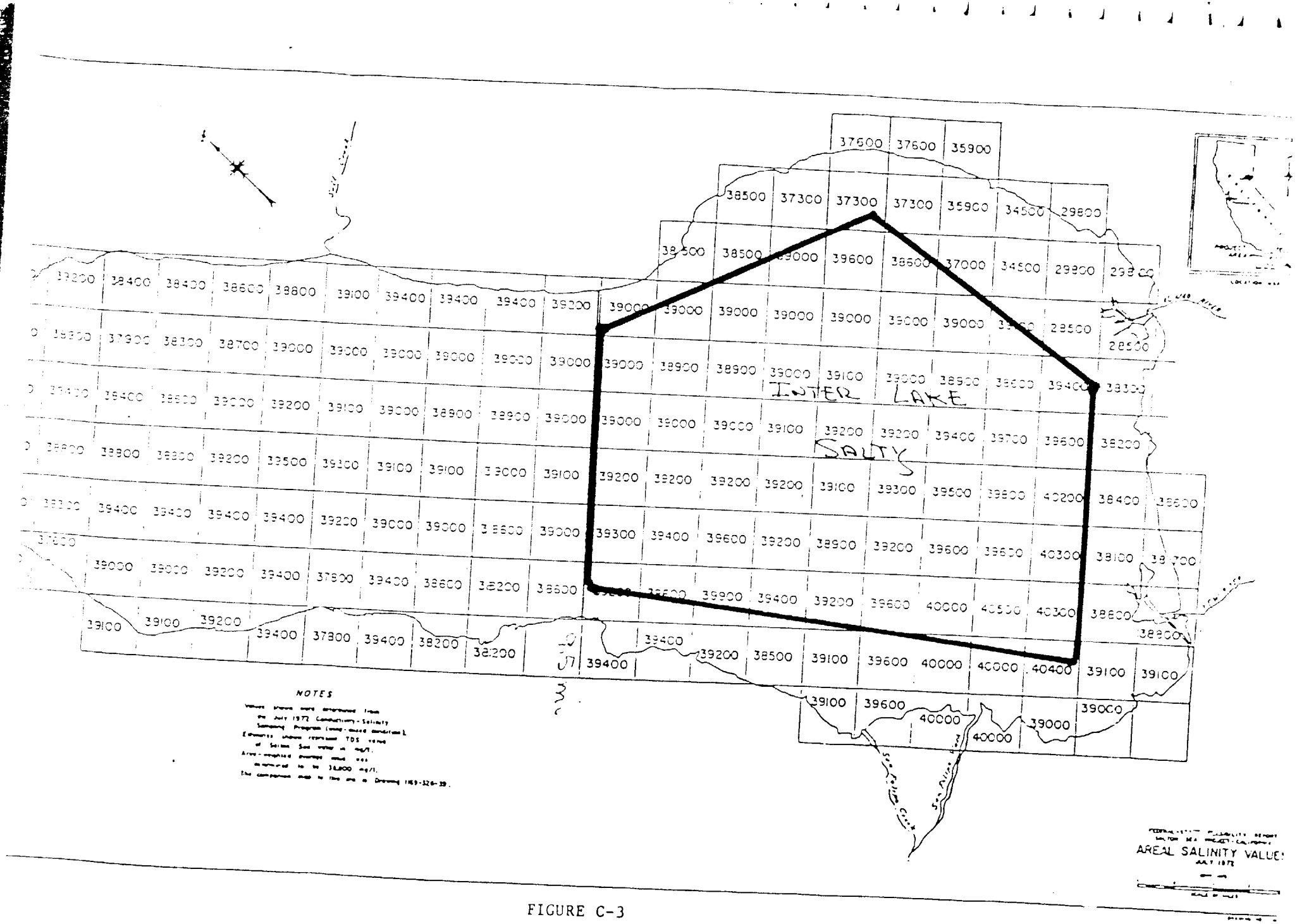

FIGURE C-3

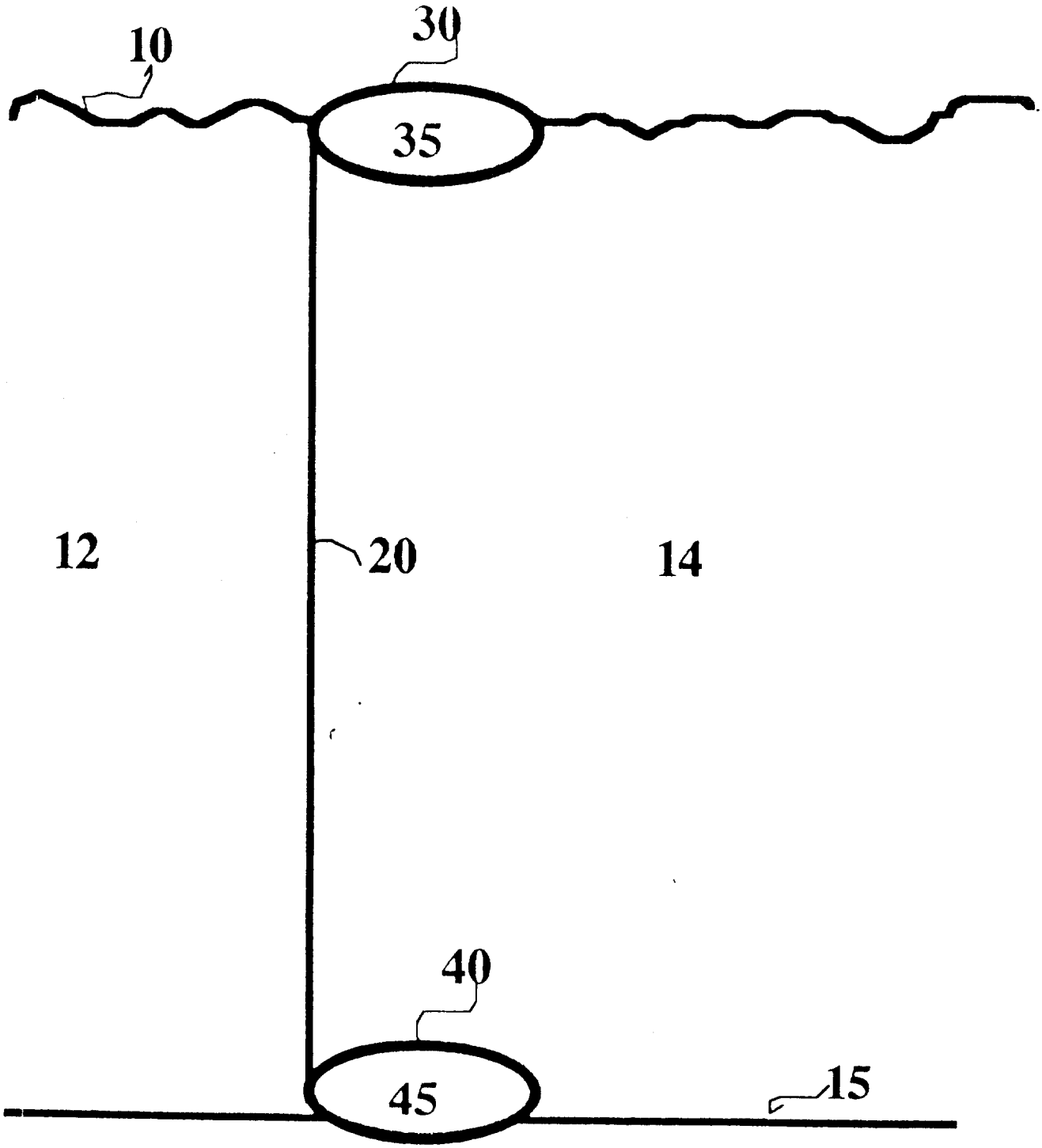

FIG. 1

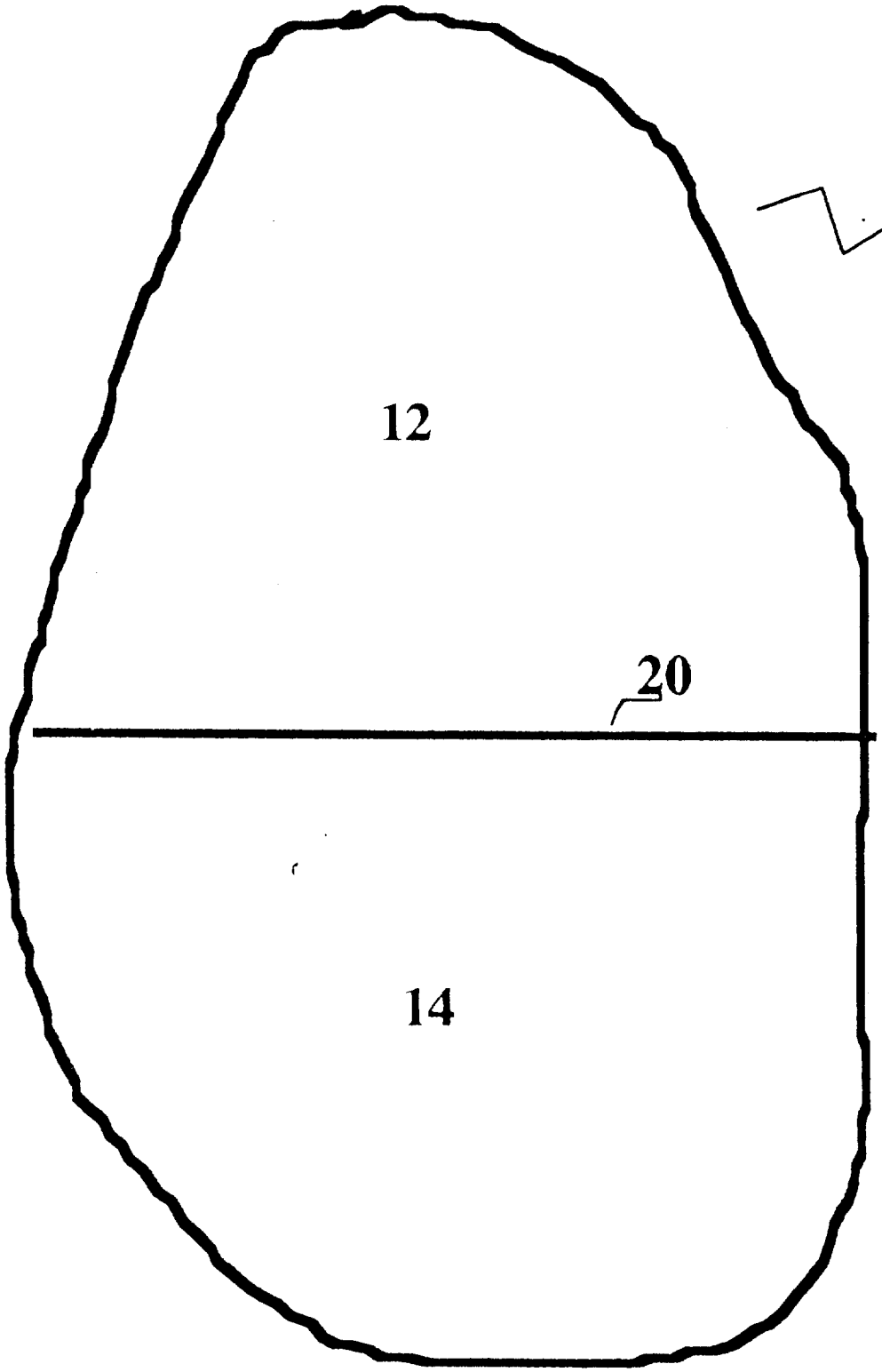

FIG.2

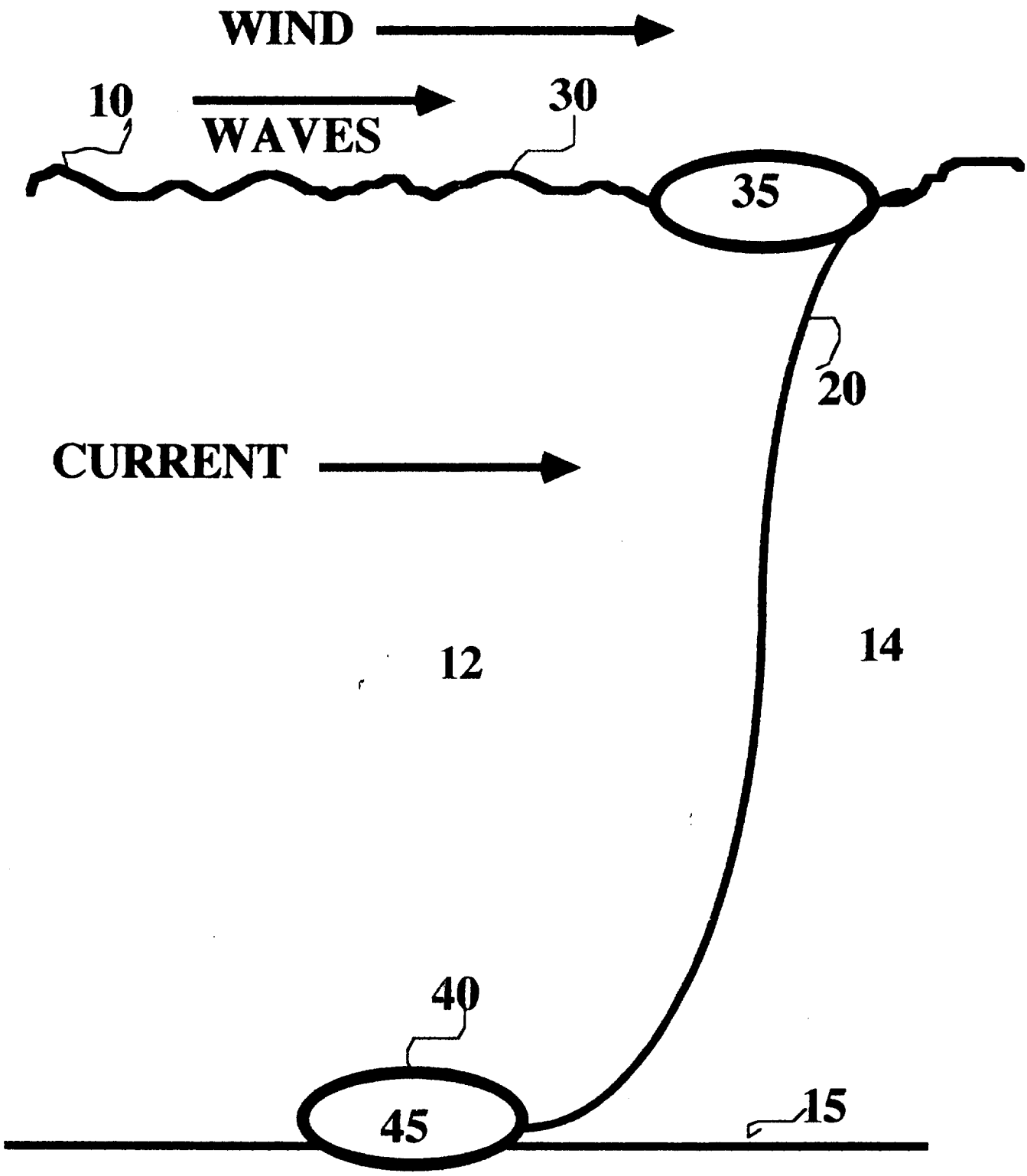

FIG. 3

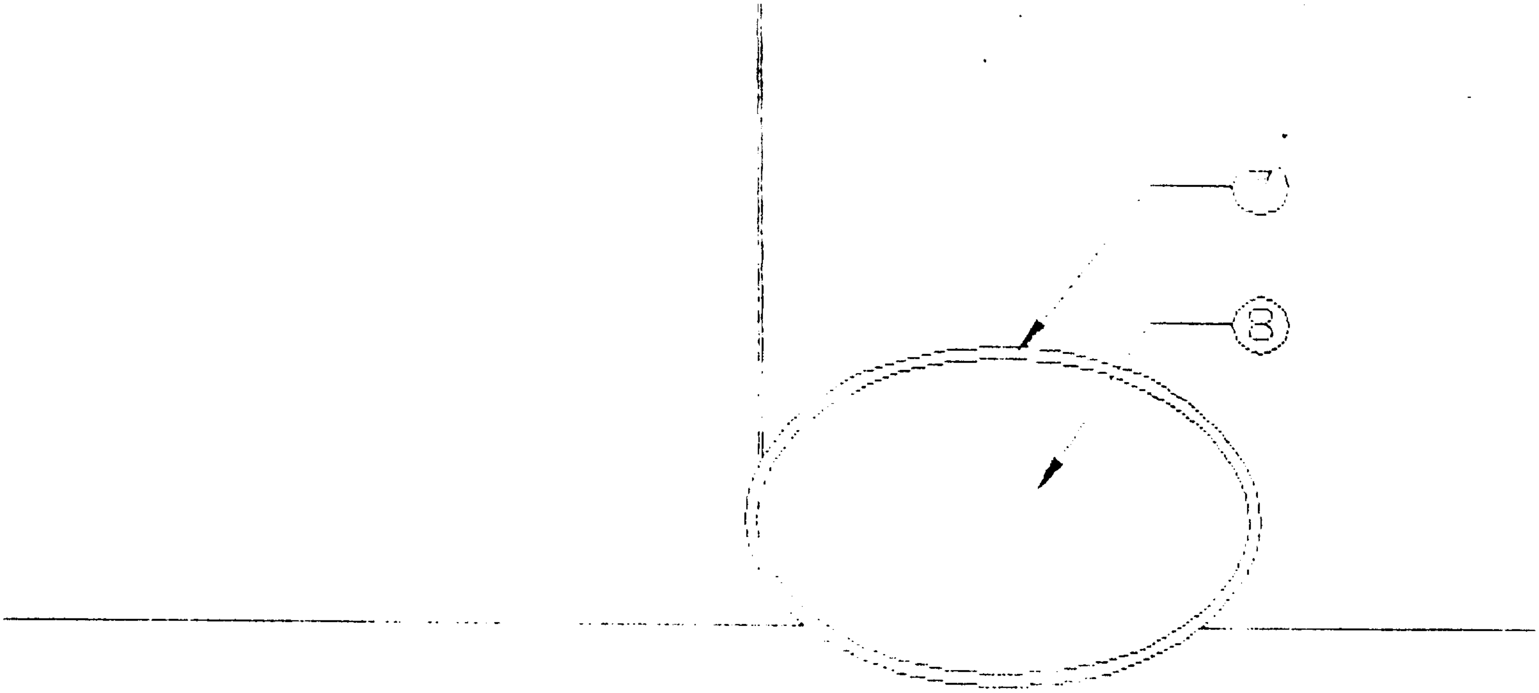

FIG. 1