

Problems in the Establishment of a Coast - Base Line of Louisiana.  
(as presented Beaumont, May '58, Soc. Civil Engineers)

Administrative problems arising between the Department of the Interior and the Louisiana State Mineral Board, relative to the development of the offshore water bottoms of Louisiana, focused attention upon the need for the establishment of a coast - base line of Louisiana. In recognition of the importance of this problem, during July, 1956, Wesley d'Ewart, then Assistant Secretary, Department of Interior, appointed a three-man committee, and William Helis, Chairman, State Mineral Board, appointed a similar committee, to engage in a joint study and determination, if possible, of a coast line that could be jointly recommended to the United States and the State of Louisiana. Joint work by these committees is underway.

The State of Louisiana's primary contention at the present time is that the coast line of Louisiana is as established by the United States Coast Guard and approved by Act 33 of 1954 of the Legislature of Louisiana. This coast line follows a line shown on Coast and Geodetic Survey charts as the outside boundary for the "use of inland rules of the road" for navigation purposes, and in places is located more than 30 nautical miles from the shore line of Louisiana. If by Supreme Court decision the State's position is upheld, the work of the committee in establishing a base line approximating the present shore line would be applicable only to the present administrative problems in which the operating oil companies are involved.

If, on the other hand, a Supreme Court future ruling involves a coast line more directly related to the shore line, such decision would

require either (1) a base line established in reference to the present coast line, or (2) a base line established in reference to the 1812 historic shore line, the date on which Louisiana entered the Union.

There is a definite ambiguity in Public Law 31, 83rd Congress, approved May 22, 1953 (the Submerged Lands Act) whereby Congress of the United States confirmed and established titles of the States to lands beneath navigable waters within State boundaries. This ambiguity involves the base line from which the seaward boundaries are to be measured.

Sub-section 2(c) of the Act, defined "coast line" (distinguished from "shore line") as meaning "the line of ordinary low water along that portion of the coast which is in direct contact with the open sea and the line marking the seaward limit of inland waters." The basic ambiguity arises because the definition does not provide specific criteria for mapping such a line, and because the time element is not specified. If Sub-section 2(c) only were to be considered, it would appear that the coast line would be as of the date of Act 31, 1953, because an older coast line would not always be in "direct contact" with the open sea in places where accretions have occurred. But, Sub-section 2(a) of the same Act defines lands beneath navigable waters, as all lands extending "to the boundary as it existed at the time such State became a member of the Union. . . . ,".

The question therefore is whether the boundary in the old days was a constant distance from the shore, wherever that shore might be at the moment, or whether the boundary was at a fixed position offshore, regardless of subsequent changes in the shore line.

It is obvious that the joint committees are faced with the problem of not knowing, and certainly not wanting to guess, which interpretation of these portions of the Act that refer to a "coastline" will finally be rendered by the Supreme Court of the United States. Under these circumstances, it appeared that the primary attention of the committees should be devoted to the present-day coast line, where for long reaches, particularly in the western portion of the State, the determination of the present shore line involved analysis of physically observable data available on the ground and through use of aerial photographs. Unfortunately, not all portions of Louisiana's coast line are regular.

It is interesting to note that no shore line of any state has ever been mapped as a property or boundary line. When the Supreme Court of the United States handed down its decision of June 23, 1947 in the California case, the Court appointed a Special Master to hold detailed hearings to determine particular segments of the coast line of California, particularly in connection with embayments, where the problems of the seaward limits of inland waters arose, and to recommend to the Court the criteria by which such limits could be established. After a long and tedious series of hearings the Special Master rendered his third report October 14, 1952, incorporating his recommendations to the Supreme Court covering his findings on a number of controversial subjects. Although the Master's report was filed in the Supreme Court, it has not yet received approval from the Supreme Court.

The problems argued before the Special Master, and which become pertinent in the determination of the coast - base line of Louisiana,

included the definition of "ordinary low water", which is not a technical term. It was interpreted by California as meaning a plane based on the mean of the lower lows. The Government's position was that the mean of all the lows (higher low and lower low) should be used.

The Master agreed with the United States, and recommended the following definition:

"The 'ordinary low-water mark on the coast of California' is the intersection with the shoreline (as it exists at the time of survey) of the plane of the mean of all low waters, to be established, subject to the approval of the Court, by the United States Coast & Geodetic Survey from observations made over a period of 18.6 years."

However, "mean low water" is defined as follows by the United States Coast & Geodetic Survey:

"The average height of the low waters over a 19-year period. All low water heights are included in the average where the type of tide is either semi-diurnal or mixed. Only the lower low water heights are included in the average where the tide is diurnal."

However, the United States Coast & Geodetic Survey also says that:

"In the use of tidal datums as planes of reference for elevations it is implied that such datums at any given place remain constant over relatively long periods of time. Underlying this implied constancy are the tacit assumptions of coastal stability and constancy of hydrographic features." We will see more about this problem of coastal instability later.

The question was argued as to whether artificial changes in the shore line, such as construction of fills, harbors and harbor works, serve to change the coast line. California contended that the concept of a port or harbor necessarily included "outermost permanent harborworks"

and anchorage areas assigned for vessels. The Government contended that only such harbors or anchorages should be included as inland waters as are protected by the natural configuration of the coast. The Government also contended that the United States retained full dominion and power over the lands and minerals underlying artificial projections and harbor areas.

The Master agreed with the State of California, and recommended that:

"In front of harbors the outer limit of inland waters is to embrace an anchorage reasonably related to the physical surroundings and the service requirements of the port, and, absent contrary evidence, may be assumed to be the line of the outermost permanent harbor works."

The problem developed as to the determination of the channel and other water areas between the main land and offshore California islands as either inland waters or open sea areas. California contended that "inland waters" included the waters between a line connecting the outer islands and the mainland. The United States contended that each offshore island should have its own three mile or marginal belt.

The Master agreed with the United States, and recommended that:

"The channels and other water areas between the mainland and the offshore islands within the area referred to by California as the "overall unit area" are not inland waters. They lie seaward of the baseline of the marginal belt of territorial waters, which should be measured in each instance along the shore of the adjoining mainland or island, each island having its own marginal belt."

A problem that received particular attention, and contention, in the California hearings related to embayments. The relations between depth of a bay and the width at the mouth of the embayment, and criteria to be applied to determine whether a coast line extends from headland to headland, or follows the sinuosities of the shore line, was the subject of prolonged hearings. The establishment of a technical method and mathematical rules for classification of the waters of a bay as "inland waters" or "marginal sea" was the subject of long argument. This problem has particular significance in relation to the Louisiana coast.

California contended that the base line should extend from headland to headland of indentations in the shore line. The United States government contended that the base line should follow the sinuosities of the coast interrupted only by definitely limited straight lines across the mouths of bays.

The Master agreed with the position taken by the United States, and recommended that:

"The extreme seaward limit of inland waters of a bay is a line ten nautical miles long. For indentations having pronounced headlands not more than ten nautical miles apart, and having a depth as hereinafter defined, a straight line is to be drawn across the entrance. Where the headlands are more than ten nautical miles apart, the straight line is to be drawn across the indentation at the point nearest the entrance at which the width does not exceed ten nautical miles. In either case the requisite depth is to be determined by the following criterion: The envelope of all arcs of circles having a radius equal to one-fourth

the length of the straight line shall be drawn from all points around the shore of the indentation; if the area enclosed by the straight line across the entrance and the envelope of the arcs of the circles is greater than that of a semicircle with a diameter equal to one-half the length of the line across the entrance, the waters of the indentation shall be regarded as inland waters; if otherwise, the waters of the indentation shall be regarded as open sea."

However, the Master pointed out the following:

"The absence from international law of any customary, generally accepted rule or rules fixing the baseline of the marginal belt is, indeed, conspicuous." Incidentally - there is nothing sacred in the master's choice of ten miles. Considerable precedent could be quoted for greater distances.

Involved in this problem I have just discussed is a definition of a "headland". The Master defined the point from which to draw a base line limiting inland waters as follows:

"Where pronounced headlands exist at tributary waterways, the appropriate landmark is the point of intersection of the plane of ordinary low water with the outermost extension of the natural headland. Where there is no pronounced headland, the landmark is the point of intersection of the ordinary low-water mark with a line bisecting the angle between the general trend line of the ordinary low-water mark along the open coast and the general trend line of the ordinary low-water mark along the shore of the tributary waterway."

Both California and the United States agreed, as expressed by the Master, that:

"Where rivers empty into the sea, the seaward limit of inland waters is a line following the general direction of the coast drawn across the mouth of the river, whatever its width. If the river flows into an estuary, the rules applicable to bays apply to the estuary."

The problem of classification of specific embayments as encompassing inland waters because they constitute historic bays, according to international law, was the subject of much argument. Specifically, testimony was presented relative to Crescent City Bay, Monterey Bay, San Luis Obispo Bay, Santa Monica Bay and San Pedro Bay. The Master reached the following conclusion regarding the five Bays selected as matters of contention:

"On the evidence submitted, I have reached the conclusion, as will presently appear, that no explicit assertion by California of exclusive authority over these water areas in dispute was ever made until in 1949 when the Government Code of California declared that the boundary described in the Constitution runs three English miles seaward from the islands, rocks and reefs adjacent to the mainland, etc. (1949 Cal. Stats., Chap. 65; Cal. 56)."

During the course of discussions relative to the Louisiana Coast, it developed that by recent Departmental Ruling (that magnificent procedure by which the Executive team waddles over into Legislative's left field) the federal government's definition of a historic bay is now one that has been defended by force against a foreign power. I might add that I have since raised the question as to whether the defense of Mobile Bay by the Confederate States against the U.S. constituted "defense against a foreign power."



Although the Special Master in the California case made his recommendations on all these problems, some in support of the State's arguments and some following contentions of the federal government, his findings have no particular legal force, because they have never received approval by the Supreme Court.

However, so confusion can be compounded, a glance at the California coast line and then the coast line of Louisiana, shows startling dissimilarities between the two areas. Primarily, the problem of determination of a coast - base line for Louisiana is greatly complicated by the profound irregularities of the eastern half of the coast that result from the presence of the Mississippi Delta. Problems face the special committees in the Delta area, and elsewhere, that are not present anywhere along the California coast nor, in my opinion, literally anywhere else in the world.

In connection with the Louisiana problem, the joint committees representing the Federal and State governments met immediately after appointment to explore the problem presented them, and to attempt to formulate a series of rules under which they would operate. It was agreed that, if our work was to be successful, we would end up with a traverse of the water line along the coast, or a contact line, that could be placed on a series of maps on a scale of 1:20,000, showing all angle points and their plane coordinates.

Recognizing the need for a practical approach to the problem, it was mutually agreed that a series of aerial photographs and mosaics taken by the Jack Ammann Company late in 1953 and early in 1954 could

be adopted for determination of the contact line for long reaches of the Louisiana coast where the gradient of the beach and the bed of the Gulf was such that tidal differences would have only slight effect upon the horizontal position of the line at mean low tide. Contracts were entered into between the Bureau of Land Management, the State of Louisiana, and the Coast and Geodetic Survey whereby the latter acted as a sub-contractor for the preparation of a series of 41 maps based upon the Ammann photos, designed to show the water line along all portions of the Louisiana coast except in the vicinity of the Mississippi Delta from latitude  $29^{\circ} 22.5'$  longitude  $89^{\circ} 15'$  to latitude  $29^{\circ} 15'$  longitude  $89^{\circ} 30'$ , and in the vicinity of Atchafalaya Bay and the coast of Marsh Island from latitude  $29^{\circ} 15'$  longitude  $91^{\circ} 22.5'$  to latitude  $29^{\circ} 30'$ , approximate longitude  $92^{\circ} 02'$ . For the portion of Louisiana west of  $92^{\circ} 30'$ , the Coast and Geodetic Survey had to construct shore line sheets in order to have adequate bases on which to transfer the contact line.

These maps were subsequently prepared according to the terms of the contract, and a series of copies turned over to the Bureau of Land Management and the State Committee. The technical members of the two committees then jointly studied each map, and selected points on the contact line so as to define a relatively straight low water line with an allowable tolerance of 50 feet. Distances between points in cases exceeded a mile. Both committees will recommend to their respective governments that the offshore coastal line be developed, at either three miles or three leagues as the Supreme Court decides, by an

envelope of the arcs of circles constructed with this traverse line as a base.

These work maps have now been returned to the Coast and Geodetic Survey for determination by them of the position on the Louisiana plane coordinate system for each such point to the nearest foot. This work will be completed shortly. At the time of the printing of these maps, with consecutively numbered points and plane coordinate data overprinted in red, the joint committee will be in possession of what must still be considered as work maps, and not available for public release. The maps will cover approximately 70 percent of the Louisiana coast.

The joint committees recognized that their problems fell into three general classes: (a) those involving questions of fact as to the existence of land above mean low tide; (b) those involving questions of judgment such as the headland points at the entrance to a bay; and (c) those involving questions of policy and legal principles, many of which had been points of contention in the California case.

It is obvious that the work done by the joint committees and the Coast and Geodetic Survey, as placed on the series of maps already discussed, falls into the first category of factual determinations. However, a number of the problems involved in the Delta and Atchafalaya Bay areas also belong in this category, but are not susceptible to determination until a mutually satisfactory tidal datum plane is established. We discovered upon investigation and consultation with the Coast and Geodetic Survey that no satisfactory tidal data incorporating the necessary accuracy was available for any part of Louisiana between the points of Biloxi, Mississippi, and Galveston, Texas. The

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obvious impossibilities of accumulating tidal observations over a 19-year period before proceeding with our problem was apparent. The Coast and Geodetic Survey informed us that by the establishment of a series of tidal stations in the vicinity of the Delta and Atchafalaya Bay, observations taken over a period of about 18 months would suffice for the determination of the necessary datum plane.

I was interested in learning that this would be the first time in the long and varied experience of the Coast and Geodetic Survey that they were confronted with a problem where vertical measurements would be the controlling factor in the determination of boundaries.

You may be interested in learning that it appears that over a period of 50 years the Mississippi Delta has subsided about 2-1/2 feet, and that during this same time there has also been a one foot rise in mean sea level. A difference of only .2 of a foot in the tidal datum plane could easily move the contact line a mile one way or another over the tidal flats. In the case of the oyster reefs in front of the Atchafalaya Bay, their presence just above or just below the tidal datum plane would literally shift the coast line 10 miles or more.

The Coast and Geodetic Survey estimated that it would cost \$75,000 to obtain tidal data necessary to map the Delta and Atchafalaya areas. At this point trouble developed. The Bureau of Land Management, Department of Interior, discovered that while it had funds available to do any necessary mapping, none of its funds could be allocated to obtain tidal data. The Coast and Geodetic Survey announced that they did not need further refined tidal data as an aid to navigation. The State of

Louisiana had already appropriated funds sufficient to carry out its share of any of the necessary work. Because it looked as if further work on the two areas of major contention would be indefinitely held up until somebody figured out a way to cut a Gordian knot, it was suggested to the various oil companies operating offshore that they put up the necessary funds to cover the tidal work. Within the past week this amount has been pledged, and I am now involved in further problems of red tape in getting contracts signed to initiate this work immediately.

After the tidal data is obtained, a program of detailed surveying on the ground will be undertaken, either by the Coast and Geodetic Survey as a sub-contractor, or more likely through parties composed jointly of the Bureau of Land Management and State engineers.

As to the specific problems exposed in the California case, the joint committees have agreed that the coast of Louisiana is subject to diurnal tides only, so that, unlike the coast of California, mean low tide will be determined by the average of the single daily low tide. In regard to harbor installations, the technical members of the committee have determined enough points in the vicinities of various jettys around the coast so that, upon agreement by the legal representatives, they can place a base line as instructed from points already determined on the maps.

The committees have jointly agreed to adopt a definition for headlands similar to that proposed by the Master in the California case.

There exists, however, points of differences between the two committees that arise from differences in basic philosophies, many of them amplified by the peculiarities of the Louisiana coast.

I find on review of world maps about twenty major delta areas that project into the open sea. Deltas may broadly be classified as "birdfoot" or "arcuate", terms descriptive of the base of the delta triangle. I find only one birdfoot delta among all the major deltas of the world, and that is the active Delta of the Mississippi River. And the Mississippi Delta would be described as a "crowfoot delta", rather than a "duckfoot delta". A major problem, therefore, facing the joint committees is whether or not technical and mathematical rules for the determination of bays, encompassing either inland waters or marginal seas, that may apply to general coast lines, may be considered applicable to such unusual irregularities of the coast as exist in the vicinity of the Mississippi Delta.

A further problem relating specifically to the unusual Mississippi Delta can be expressed as follows: Do the combined active distributaries of the Mississippi present-Delta constitute the "mouth of the river"? If they do, then under the Master's findings, straight lines connecting the ends of the distributaries mark the seaward limit of inland waters, without regard to the length of the lines.

Webster's dictionary defines a delta specifically as "The alluvial tract of land at the mouth of the Nile, enclosed by its spreading branches."

Islands or reefs that block the entrance to bays, where they become critical in determination of the enclosed waters as inland waters or marginal seas, pose a problem on the Louisiana coast that was not

present in the California case. In that connection, the Louisiana coast is peculiar in that the only reported occurrence in the world that I can find of live oyster reefs forming the shore line of an open coast, is the extensive Pointe Au Fer shell reef and the reefs on the seaward side of Marsh Island. A critical point for future determination is the extent and elevation of these reefs above mean low water.

A problem unique to the Louisiana coast, and one which has occasioned discussion, is that of the famous Mississippi Delta "mud lumps." These low mud islands appear erratically off the mouth of the active Mississippi Delta, and form islands above sea level. For the most part, they are relatively short-lived, but form features of the coast that will have to be considered in the establishment of a present coast - base line.

Probably nowhere in the world are such rapid shoreline changes taking place as in the vicinity of the active Mississippi Delta. Land areas in the vicinity of Main Pass, on the northeast side of the Delta, are currently building up so rapidly that an aerial survey is out of date within months after being flown. On the other hand, in the same general area, as for instance in the vicinity of Southwest Pass, contemporaneous erosion is relatively rapid, and maps made only a few years ago show land areas that no longer exist. In the vicinity of Garden Island Bay the advance has averaged about 1,300 feet per year over a 29-year period.

The problems I have just discussed all relate to the determination of the present coast - base line. The problems inherent in the establishment of the 1812 coast - base line would presumably include all of these, plus agreement, first by six technical men and then by their respective governments, as to where in the hell all these things were in 1812.

The Coastal Studies Institute, Louisiana State University, under the supervision of Dr. James P. Morgan, attempted to establish the historic shoreline of Louisiana as of 1812. A report of their work, including numerous maps, was published December 15, 1955. During October 1955, testimony of Dr. Morgan was taken by deposition in the Supreme Court of the United States relative to the dispute between the United States and the State of Louisiana. Dr. Morgan and his group examined nearly 800 maps of Louisiana. They selected as sufficiently accurate aerial photographs flown in 1954, Coast and Geodetic charts of 1932, and United States Coast and Geodetic Charts of 1886. Plotting the variations of the shorelines of 1954 and 1886 in cross section from the 1932 location, which as Zero was used as a reference point, they extrapolated backward to the year 1812. This work was done for the entire coastal Louisiana at points only a mile apart. They demonstrated by this method that certain portions of the coast of Louisiana had advanced through the intervening period between 1812 and 1954, while others had eroded. I might say that my own observations from the air along the Louisiana coast of the various physiographic features, indicate for the most part quite clearly which portions of the coast have been eroded and which have been built up. Dr. Morgan's study was an attempt to determine the amount of erosion or accretion quantitatively.

One of the basic problems involved in determination of the 1812 coast line is that of wandering islands. Islands along the Louisiana coast composed primarily of sand tend to migrate roughly parallel to the coast while preserving their original size and shape. Thus Timbalier Island has moved with mappable times from position A on the east to



position B on the west, far enough so that no part of position A is overlapped by position B, while maintaining its identical size and shape.

On the other hand, islands that are remnants of natural levees built by distributary streams of the older Mississippi deltas, are composed primarily of particles of silt and clay size. These islands remain fixed in their position, but are subject to constant erosion and reduction in size, as waves remove the mud and silt to carry it out to deeper waters. These islands, therefore, tend to disappear. Unquestionably in 1812, there were many such islands off the coast of Louisiana of which we have now lost all record. Wine Island, near the mouth of Terrebonne Bay, appears on all the latest coastal maps. It exists only as a very small mud island a few feet across.

It is impossible to predict at this time whether all the problems involved in the determination of a coast - base line for the State of Louisiana can be solved to the satisfaction of both governments, although I feel the committee members will make every effort to resolve these problems objectively. I know that for substantial portions of the coast agreement is possible. The resolution of all of these problems would obviate the necessity of prolonged hearings before a Special Master, to be appointed by the Supreme Court after it has reached a decision regarding the extent of ownership of the Louisiana offshore water bottoms.

It is the hope of the joint committees that our respective governments will adopt our recommendations that, having completed our work as soon as possible after the effective date of the Submerged Land Act, the offshore coast line, whether it be three miles or three leagues from our mapped

contact line, be adopted as an administrative line, to remain fixed during the productive life of oil and gas fields on the continental shelf.

I must also say that the objective and scientific approach of the technical members of both committees has proved one of the most pleasant features of this problem.

Similar situations such as I have described will, of course, confront the other states bordering the Gulf of Mexico in relation to ownership of offshore oil and gas producing structures. The lack of precedence, while complicating the problem, makes it an intriguing one.

CURRENT MIS. INFORMATION

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PROBLEMS IN  
ESTABLISHMENT OF  
LOUISIANA COAST

— LINE —

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