Number 9 Original

In the Supreme Court of the United States

OCTOBER TERM 1968

UNITED STATES OF AMERICA,

Plaintiff,

v.

STATE OF LOUISIANA, ET AL.

Appendices to Brief of the State of Louisiana in Support of its Motion for Entry of Supplemental Decree No. 2

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APPENDIX A

CONSIDERATIONS OF AMBULATORY BOUNDARY AND COASTAL DYNAMICS WHICH SHOW THE NEED FOR A STABLE BOUNDARY SUCH AS WOULD BE AFFORDED BY THE INLAND WATER LINE.

If Louisiana's primary contention is rejected and it is held that the Inland Water Line is not the coast line, this Court will have to fix a coast line which is largely dependent upon the ever-changing ephemeral shoreline configurations of the mainland and countless islands and low-water elevations. If one could arrest the flux long enough to get a complete picture of what this complex geography was at a given moment in time, thus enabling one to take into account all relevant considerations, the task might not be totally impossible.

It would still be exceedingly difficult, owing to the presence of innumerable legal, geographic, physical and other complexities.

What has been attempted by the United States (and by Louisiana in urging its alternative positions) is similar to trying to halt the processes of change —an attempt to fix the approximate location of the coast line, as of particular times for different sectors.[1] We say *approximate* because the technical difficulties of the surveying task makes it impossible to do a survey without the occcurence of material changes in conditions during the very time the survey is being made.[2] The surveying task along major segments of the

[1]The set of 54 maps represent, for certain sectors, the interpretation of aerial photography flown in 1954. As to other sectors, photography and surveying of different portions were done at different times between 1959 and 1961. See 1 Shalowitz, *Shore and Sea Boundaries* 173-180 (1962).

[2]For example, Louisiana has islands subject to frequent movement, change, emergence or submergence. The field notes concerning the survey of the elevations south of Marsh Island, show that in the days between visits to the particular islands or low-tide elevations, the land elevations had fallen or risen each time. Although we know no precedent or rule to support the approach, the U.S.C. & G.S. found it expedient to creatively employ mean *land datums*, based on the average elevation of the land during whatever accidental number of visits the survey crew may have made to a particular locale. This is to be distinguished from the matter of employing the mean high or low-*water* datums from the records extending over 18.6 years, which was done in the Louisiana survey work and is commonly done elsewhere. There has never been another case, to our knowledge, where the land elevations were so changeable in relation to relevant water datums that average *land* elevations had to be computed. The same type of land datum averaging was done at numerous locations. At South Pass of the Missis-

Louisiana shore is immensely challenging and expensive, even for the limited purpose of ascertaining the approximate low-water line at a particular time.[3]

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sippi, where close studies have been made, since 1948, 1.4 new mudlumps have appeared every year in recent years. See Morgan, Coleman and Gagliano, "Mudlumps: Diapiric Structures in Mississippi Delta Sediments," figure 10, p. 153, published in Diapirism and Diapirs—Memoir No. 8, American Association of Petroleum Geologists (1968). Of 104 mudlumps at South Pass mapped or observed during 79 years which were studied, 45-50 were present as emergent islands at different times, with more than 30 present in 1961, either as islands or joined to the mainland. *Id* at 147, 149, 152. This is but one of several passes where frequent mudlump activity occurs. Islands move laterally, also. One island which has been closely studies has moved 5½ or more miles. See Appendix B. (Morgan statement.)

[3]See 1 Shalowitz, *Shore and Sea Boundaries* 173-180 (1962), for a discussion of the unusual technical and expensive complexities involved in the low-water survey. In spite of the best technical efforts of the U.S.C. & G.S., the resultant set of 54 maps still fails to present complete information for determination of base lines calculated by reference to the shore line. For example, the inner shore lines of many indentations were not surveyed, but only outer segments were surveyed—e.g., in the West Bay area, the Timbalier-Terrebonne Bay complex, Barataria Bay and at other locations. To have done truly complete work along the thousands of miles of marshy shoreline would have been immensely time-consuming and expensive and perhaps unnecessary at places such as West Bay and Barataria Bay, where nautical charts, although perhaps less precise or recent in topography, nonetheless clearly show so great an expanse of inner waters as to make it plain that relevant legal criteria, like the semi-circle test, are clearly satisfied. However, at places like East Timbalier Island, the absence of low-water survey work inside the foreshore of the land form makes it doubtful whether openings in the foreshore are continuous through the rear part of the land form. This may affect headland selection problems, depending on the nature of the federal position.

Once the low-water or high-water lines are established as of a particular moment of time or time-period covered by survey work, the continuing validity of the information becomes most questionable in most sectors. The fact that the Louisiana shore is a frequent victim of hurricane and other severe storm attacks is common knowledge.[4] Although other portions of the United States may also have frequent hurricanes, none have a shoreline so especially prone to significant change as a result of the attacks.[5] Millions of acres

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[4]See Fig. 3, in Morgan, Nichols and Wright, *Morphological Effects of Hurricane Audrey* 12, Coastal Studies Institute, Louisiana State University (1958), for a chart showing fifteen hurricanes known to have affected the western Louisiana shores. This was a study for the United States Office of Naval Research of a hurricane which struck western Louisiana. Frequency of hurricane attack on the eastern Louisiana shore is undoubtedly just as great.

[5]*Id.* at 36. There Morgan, et al, state:

> "Beaches which stand high above mean sea level and are not deeply inundated by the storm tides, do not behave in the same manner as low beach areas. Most of the Atlantic Coast beaches are flanked by nearly continuous sand dunes due to the abundance of sand available. Only in a few areas of Louisiana is there enough sand to allow the formation of appreciable dunes. In addition, the generally higher tidal range of the Atlantic Ocean also results in higher and steeper beaches. Inundation of these beaches would be likely only if the hurricane coincided with lunar high tide, particularly at spring-tide. Complete inundation is the rule rather than the exception, along the Louisiana coast."

Much the same comparison, if not stronger, could have been made to the Pacific Coast, which was not under study as it has no hurricanes.

—indeed entire parishes dozens of miles inland —of coastal marsh and shore lands can become inundated.[6] Islands may be obliterated. The delicate ecology of marsh or marine growth may be altered in various sectors,[7] altering the balance in the battle between sea and land. Minor distributaries of the Mississippi and other streams might have their courses barred or altered under the impact of severe wind-driven inundations. Levees may be crevassed, resulting in changes in the sediment deposition that tend to counteract submergence or erosion of the coastal lands,

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Elsewhere, Morgan, et al, point out that it is not the wind and rain of hurricanes but:

> "The most destructive effects of a hurricane in a low coastal region such as southwestern Louisiana, where beaches are in equilibrium with a normal lunar tide of less than two feet, are those produced by the storm-whipped sea. The West Indian Hurricane has a dramatic effect upon the sea. It raises waves and tides out of all proportion to the norm, and these are the prime agents in affecting morphological changes." *Id.* at 9.

[6]In Audrey, which killed more than 500 people in 1957, "Tidal salt water covered all of Cameron and most of Vermilion Parishes, and penetrated far inland in Terrebonne, Lafourche, and Jefferson Parishes." *Id.* at 6. In 1964, Hilda's "High tides and headwater overflow . . . inundated some 3,100,000 acres of coastal lands in Southeast Louisiana and 955,000 acres . . . bordering various inland streams. . . ." *Hurricane Hilda* 6, Report by U. S. Army Engineer District, New Orleans (1966). In 1965, Betsy's "tides" flooded practically all of Plaquemines Parish, and much of 17 other Southeast Louisiana parishes, including large portions of New Orleans. *Hurricane Betsy After Action Report* 10-13, Corps of Engineers, New Orleans District (1966).

[7]See Morgan, et al, *Morphological Effects of Hurricane Audrey* 49.

thus either causing new land growths or eradicating old land forms.[8] The extreme flatness of many areas, especially the Mississippi Delta area, necessitates critical tolerances in the determination of the mean low-water line; e.g. an inch or two of difference in land elevation affects great areas in determining the shore line. See 1 Shalowitz, *Shore and Sea Boundaries* 176 (1962). It is evident that in such areas even slight changes in the hydrology, sedimentology, or ecology might wreak great changes in the topography, either by land building or land destruction.

The geographic configurations at various places are such that if shoreline configurations determine inland water areas, changes create situations ripe for litigation which might cloud titles for great areas. For example, until man interfered with the natural flow of the waters escaping from distributaries of the Mississippi along South Pass, there was a great land form created by the natural levees of that distributary, known as Grand Pass or Grand Bayou, which made the area of East Bay greater than a semicircle whose diameter was a closing line for East Bay.[9] After some great flood or hurricane, we may again see

[8]Seven hundred feet of a levee section in St. Bernard Parish were destroyed and numerous other levee damages were sustained in portions of the river above Venice, during Betsy's 1965 attack. *Hurricane Betsy after Action Report* 49-56, Corps of Engineers, New Orleans (1965). Had the coincidence of factors of wave direction, wind force, water heights, etc. occurred in the delta as they did at these upriver locations we might now have a vastly rearranged delta, from crevasses.

[9]See Appendix B.

such a distributary come into being.[10] Such an event could cause a substantial portion or all, of East Bay to meet semi-circle test criteria.[11] The southwesterly trend of land-building at the tip of South Pass, suggests that East Bay is destined to some day again have a configuration which will satisfy the semi-circle test,[12] even

[10]If one examines the indentations formed by other major passes of the River—e.g., Pass a Loutre and Main Pass—it will be noted that there has been substantial crevasses or cuts, which have formed sub-embayments.

[11]Morgan points out that it is in the nature of the river mouth processes to crevasse, build land masses between the major passes, which subside over the decades, then when an embayment reaches a more open condition, new major crevasses occur to again build out distributary land masses. As to East Bay's present more open condition, he states: "How long this will continue to be the case is questionable." Morgan, "Ephemeral Estuaries of the Deltaic Environment," published in *Estuaries*, p. 115, 117, Publication No. 83 of the American Association for the Advancement of Science (1967). See also Dr. Morgan's statement, Appendix B.

[12]There is a sand spit building southwesterly at the tip of South Pass, which has grown greatly during recent decades to a length, when surveyed in 1961, of approximately 6,400 feet. Some 1,500 feet westerly or southwesterly of it, there is a mud lump island, which appeared in 1948, and is identified in mud lump studies as Mudlump Island No. 93. This sand spit growth is described in Morgan, Coleman and Gagliano *Mudlumps at the Mouth of South Pass* 7 et seq, L.S.U. Studies Coastal Studies Series No. 10 (1923), as caused by the extension of the sand spit by bar sand deposits growing to the mud lump islands. In 1963, Morgan, et al, wrote:

> "The 1961 survey of this sand spit, made specifically for this study, continues to show the progressive southwesterly extension of the sand spit. Mudlump Island No. 93 (SP-3) has increased enormously in size and there is now a broad sandy shoal partially blocking the channel between Nos. 89-90 (mudlumps at the tip of the spit) and

if a major crevasse does not develop to restore the old Grand Bayou land mass or a similar peninsula.

This raises the subject of another imponderable of change—increasing works and activities of man. Just as the land masses which were the natural levees of the former Grand or Grand Bayou distributary

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93. In the not too distant future it is quite probable that Island No. 93 will also become part of the mainland through further extension of the sand spit." *Id* at 12.

They noted further that the process may be periodically interupted by hurricane or severe storm damage to the sand spit, which erodes more readily than the mudlumps, but hurricane damage is repaired by natural deposits in a few years and the process resumes. In 1965, mudlump island 93 had grown to 1,500 feet long by 400 feet wide. Also, a smaller submerged mudlump (No. 94) in the vicinity, had appeared above water in 1964 and grown to an emergent linear extent of 500 feet. Morgan Coleman and Gagliano "Mudlumps: Diapiric Structures in Mississippi Delta Sediments", in *Diapirism and Diapirs—Memoir No. 8,* 156, 157, American Association of Petroleum Geologists (1968). Morgan still predicts continuation of the trend. Appendix B. It the spit continues its southwesterly growth of the past, the closing line distance between South Pass and Southwest Pass will be reduced proportionately to the increasing extent of waters behind the line, thus ultimately causing the whole of East Bay to satisfy the semi-circle test. Recent unpublished reports of Coastal Studies Institute personnel indicate new unsurveyed seaward mud lumps, continuing the trend. Undoubtedly, however, these new mud lump islands have brought East Bay even closer to satisfaction of the semi-circle test, than indicated by the set of 54 maps. Any uncontrolled crevassing along Southwest Pass or South Pass, could rapidly form new peninsulas, which in combination with the southwestwardly growing South Pass sand spit, might cause large portions of East Bay, Gulfward of the area which presently satisfies the semi-circle test, to unquestionably satisfy that test even before the whole of the area meets the test.

at the South Pass area disappeared after late 19th century navigational improvements in South Pass, so might other works wreak equally dramatic change in other areas. The generally very shallow conditions off the Louisiana shores, present for great distances, often require channels or harbor-work improvements to be quite substantial. Oil operations, frequently requiring canals and cuts, are quite prevalent at numerous on-shore and off-shore locations. On a large-scale map, one sees a myraid of canals and channel improvements, or other man-made changes, with all the imponderable consequences such changes might have for the shore segments involved. Fishermen or hunters may cut a narrow river bank, to make a pirogue short cut into a bay, and a hundred square miles of land may be built by the new crevasse.[13]

The Court should take full cognizance of the peculiar geology of Louisiana. To our knowledge it is the only place in the world where conditions combine to enable a great river to build a substantial bird-foot delta into the sea.[14]

Such a delta is clearly prone to dramatic coastal dynamics. The unique mudlumps it generates at the mouths of its passes were the subject of the case of *The Anna*[15] which recognized their character as islands.

[13]This has happened in the past. See Opinion of the Solicitor General dated December 20, 1963, at p. 31, where Mr. Cox describes how two daughters of a fisherman, and another fisherman, made two cuts which built one hundred square miles of land.

[14]See Appendix B. (Morgan Affidavit).

[15]5 Rob. 373 (1805).

They have also posed special problems in regard to the mainland land growths ultimately reaching out and attaching to the islands, thus building new mainland land forms with time.[16]

As a general proposition many of these mudlumps grow to quite substantial size and elevation and ultimately sediments tend to unite them with the shore creating new mainland areas of relatively secure permanency and stability, which is true even with regard to many of those which for a time are submerged. The mudlumps phenomenon is more fully discussed in the attached Appendix B, by Dr. Morgan, but some discussion here seems in order to add to an appreciation of the complexity of our coastal conditions.

Mudlumps are formed by a type of mud which underlies more recent sediments deposited at the mouths of the Mississippi Passes. As the overlying sediments increase in size and weight and grow seaward they increase the pressure upon the underlying softer mud strata, and push the underlying mud forward and upward, forming elevations which intrude up through the overlying sediments. The resultant elevations may be submerged, barely exposed at mean low water, or many feet above mean high water. They may vary greatly in area from very small islands to very large and substantial islands. The islands may remain and expand to become land masses and the

[16]See Opinion of the Solicitor General, addressed to the Secretary of the Interior, dated December 20, 1963, which discussed this.

general trend is to become attached to the shore as the delta grows outward, as noted above; or some of them may erode from severe storms, although they remain as submerged elevations that may again be pushed up in some area or become part of the advancing river-mouth bar. Today where there is a clear expanse of water, next month there may be an island of quite considerable size which in time may become even larger, and consolidate with the shore. Geographic configurations can be vastly modified with chaotic effect on the geometric baseline determinations based on shorelines and island shapes and locations. While these natural extensions of the mainland, which are the lead stage of advancement of the shore of the mainland, must be given effect if shore line configurations are used, how much more sensible it seems to do as agencies of the United States Government have done in demarking the Inland Water Line seaward of the mudlumps to avoid the frequent changes that will occur in the path of the river's march seaward.

The mud-lump problem is not confined to South Pass, although this pass has been the subject of more intensive studies. Major mud lump islands are found at nearly all the passes. Submerged mudlumps are present at Southwest Pass, and from time to time have appeared above water. For a long time the jetties tended to prevent mudlump activity at Southwest Pass, by causing sediments to be deposited in deeper waters. But now the growth of the bar deposits, is so great that we may soon see island formations

emerge permanently above water.[17] The probable result of the trend at Southwest Pass is such that a closing line for West Bay would be progressively moved seaward, marching in stages through present or potential oil fields, as a pronounced peninsula moved westward, forming the unquestionably pronounced southern headland of an enlarging West Bay. Of course, even if the closing line for West Bay were not affected, still a belt of water miles wide and starting three miles from the jetties would be affected, as each new island would generate many square miles of extra marginal sea.

It is not merely at the mouths of the passes that we have dynamic deltaic changes. Dr. Morgan[18] has

[17]Morgan, *Mudlumps at the Mouths of the Mississippi River,* 61-64, in *Genesis and Paleontology of the Mississippi River Mudlumps,* Geological Bulletin No. 35, Louisiana Geological Survey (1961). In Figure 41, p. 66, *op.cited supra,* Morgan shows thirteen submerged mudlumps approximately 1½ to 2 miles Gulfward of the jetties, south and west. He observes, at p. 64 that those mudlumps "nearest the surface of the bar have been incorporated into the main mass of the bar. Once surrounded by the sandy silt mass of the bar, these intrusions from beneath are established and may ultimately be forced up into islands." The one shown as 3 feet below M.G.L. on figure 41 was for a time above water, and one will notice that at the time of the study there was less than 10 feet of water for the bulk of the distance between it and the west jetty at Southwest Pass, based on 1950 hydrographic work. It is reasonable to believe that there has been continuing massive sedimentation at Southwest Pass for the past 18 years; that this 10-foot depth is now lessened, and that we may soon see a great sand spit extending from Southwest Pass tip of jetties westward, building to westerly mudlumps, similar to the development at South Pass.

[18]Professor of Geology, Coastal Studies Institute, Louisiana State University.

described another dynamic phenomenon in the indentations formed by the passes. In his attached statement, Appendix B, and in a scientific paper[19] Morgan has pointed out that in the indentations the river forms with its "bird foot", crevasses occur which may build great peninsulas around new sub-passes, or even entirely fill in large areas of land. Ultimately, great portions of the land thus made may subside into the waters due to compaction and erosion, if the crevasses are closed, naturally or artificially. Thus, we have geologic cycles of land building and land disappearing which can be quite dramatic when critical phases are reached. For example, in 1816 Morgan shows that most of the area seaward of "The Jump" was a great bay which included the bay now known as West Bay, north of Southwest Pass.[20] "In 1839 a crevasse called The Jump allowed Mississippi waters to flood West Bay. Sedimentation was rapid . . . Subsidence has now become dominant . . ." [21] Figures 4 and 5 of the Morgan article show the great change by dramatic expansion of West Bay.[22] Comparsion of the 1967 editions of U.S.C. & G.S. Chart No. 1272, to editions of the late 1950's shows dramatic land loss. The 100 or so square miles which resulted from The Jump's sudden birth are now falling back into the water. If shoreline headlands are employed, and pres-

[19]Morgan, "Ephemeral Estuaries of the Deltaic Environment," in Estuaries, p. 115, Publication No. 83 of the American Association for the Advancement of Science.

[20]*Id.* at 118, figure 3, showing 1816 Chart by Captain Pousson.

[21]*Id.* at 117.

[22]*Id.* at 118.

ent trends continue, before very many years, the land at the mouth of Pass du Bois (the north headland of present West Bay) will be no more, or at best, only a small island. Then for a time, perhaps the mouth of Tiger Pass would be the headland; and ultimately in 20 to 30 years from now, the land built by The Jump will be gone, with a greatly enlarged West Bay occupying scores of square miles of former land area to the north of the present West Bay to the vicinity of Sandy Point. As these changes occur scores of square miles of former federal waterbottoms would become state waterbottoms, if changing shoreline configurations were to control instead of the Inland Water Line. Ultimately, if Sandy Point became the northern headland of West Bay, in 20 or 30 years perhaps as much as fourscore square miles of waters would change ownership with litigation every 3 or 4 years to determine the new boundary as the disintegration progresses,[23] moving the closing line seaward.

Morgan also points to the fact that the present configuration of East Bay was a direct consequence of man-made works which caused a major land form along Grand Bayou (now extinct due to engineering works) to become dominated by subsidence and erosion factors, when water flow of the cre-

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[23]Morgan predicts the land formed by The Jump will revert to an enlarged West Bay in 20 or 30 years. Appendix B shows that the pre-jump water area extended to the vicinity of Sandy Point, which was also the approximate locale of the closing line wisely employed by the Secretary of the Treasury in his 1895 demarcation of the line which separates inland waters from the high seas. See Exhibit 6.

vasse was terminated.[24] East Bay would have met the semi-circle test, and indeed did meet the modern semi-circle test, before the late nineteenth century artificial works which enabled erosion forces to gain dominance. But as Morgan has pointed out, the subsidence phase of inter-Pass indentations is normally followed by crevassing and land building. He points out that East Bay was formerly filled with crevasse deposits, and observes: "It is apparent that estuarine East Bay is a potential crevasse site of the future. *** the area has become progressively more open with subsidence processes overshadowing those of sediment deposition. *How long this will continue to be the case is questionable.*" [25] (Emphasis added). This was the geologic condition prevailing at Bay Ronde until, a fisherman's [Cubit's] daughters removed a few shovels of dirt from the Mississippi banks in 1864, and old Baptiste Collette, another fisherman, did the same thing in 1874, causing the Mississippi to build a hundred square miles of land in new outlets known as Cubit's Gap and Baptiste Collette Bayou. This was the geologic case before the crevasse into Garden Island Bay, which created peninsulas and bays within the bay. This was the condition prior to "The Jump" west and upstream from the Head of Passes. This is the condition which corings have shown regularly precede substantial geographic modifications through sub-deltaic crevassing.

[24]Appendix B.

[25]Morgan, "Ephemeral Estuaries of the Deltaic Environment", in *Estuaries* 117, American Association for the Advancement of Science (1967.)

Again, how much wiser it seems to avoid the future litigation and title uncertainty by recognizing the Inland Water Line; or if this is not done, by recognizing that East Bay is indeed a bay, geometric or historic; or if this is not done, by recognizing that it is inland waters because it was once so unquestionably inland waters.

Indeed, this last mentioned approach has been the position of the United States as reflected by its proposals at the 1930 Hague Conference, so ably presented by Mr. Miller, the chief delegate, at which time he also noted that the historic bays terminology failed to completely deal with a basic, underlying principle of that doctrine—*that waters, which have been under the jurisdiction of a coastal nation are deemed to continue a part thereof*, by whatever name or label that may be used in service of this basic principle.[26]

[26] "Mr. Miller (United States of America):

"The delegation of the United States is not in accord with Basis of Discussion No. 8 as at present drafted, but for reasons which are quite different from, and even opposed to, some that have already been expressed.

"I would mention in passing that the delegation of the United States has this morning laid on the table certain amendments which are of a rather technical nature and which I do not propose to discuss; this question is not, in my opinion, one of historic bays. Both words are inaccurate—both 'historic' and 'bays'. It is a question, so far as the latter word is concerned, of waters, not merely waters that either from habit or some technical definition are called bays, but waters by whatever name they may generally or technically have been called. Furthermore, the word 'historic' is an inaccurate word, because it is not only a question of history, it is also a question of

The United Nations Secretariat has recognized this position of the United States in its commentary on the scope of the theory of historic bays.[27]

Although Mr. Miller's remarks and the statement of the principle in the U.S. proposal were made in the particular context of discussing the extent of the historic waters doctrine, particularly with respect to whether waters other than bays were covered by the doctrine, it is nonetheless true that the thrust of the remarks and the stated principle were designedly broad. Indeed, they were plainly intended to establish that once waters have been under inland jurisdiction they continue under such jurisdiction.[28]

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the national jurisdiction of the coastal State. That, I submit, is the question involved in regard to these waters, and the continual use of the expression 'historic bays', with mention of one or two bays here and there in different parts of the world, has led to a great deal of confusion of thought as to the principles which are involved.

"I wish to call attention to the amendment proposed by the delegation of the United States as an additional article in Document 19, paragraph (c). I desire to read the first paragraph:

" '*Waters, whether called bays, sounds, straits, or by some other name, which have been under the jurisdiction of the coastal State as part of its interior waters, are deemed to continue a part thereof.*' " (Emphasis added.) III *Hague Conference for the Codification of International Law* 107 (1930).

[27]Historic Bays (Memorandum by the Secretariat of the United Nations) Doc.A/Conf.13/1, I *United Nations Conference on the Law of the Sea* 37 (1958).

[28]The historic waters doctrine and applicability to East Bay are more fully discussed elsewhere in this brief, the in-

Mr. Miller was well informed about the peculiar local geographic dynamics of Louisiana, especially the dynamics of the Mississippi mouth.[29] It is, therefore, reasonable to conclude that his statement of the principle was made with the need to achieve a modicum of stability in the Delta, expressly in mind.

A moment's reflection plainly shows the practical sense of such a principle, whether it be considered under historic bay concepts or as a *sui generis* legal concept for the truly *sui generis* nature of the Mississippi Delta. The international community has no valid interests in the shallow bays of this delta, but they are immensely important to the local inhabitants and their economy. They form (1) important wildlife refuges, (2) regulated hunting grounds, (3) tremendous shrimp breeding and harvesting grounds, (4) local, shallow navigation routes important for inland vessels but useless to large seagoing vessels in

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stant discussion being limited to complexities posed by coastal dynamics and the need for legal solutions to avoid the complexities of the dynamics.

[29]Mr. Miller stated:

> "As regards the diversity of local situations, however, we have had put before us a really extraordinary amount of useful information, and I think I may speak for other members of the Committee as well as myself when I say that some of us have learned much from our discussions. For example, we have been told something of the unique coast of Norway; ****We have even been told that, in a country as new as the United States, there are to be found geographical peculiarities, and we have discussed the moving islands at the mouth of the Mississippi.*" *III Hague Conference for the Codification of International Law* 147 (1930). (Emphasis added).

international traffic, (5) commercial and sport fishing grounds, (6) important way stations for the great duck and geese migrations, (7) pipeline sites, (8) oyster beds, (9) and many, many other important usages. Not the least of the important factors is that they are at the strategic mouth of the great river and in times of national insecurity would be vitally important, as it was in the days of World War II. It would be catastastrophic to permit foreign vessels to lay in the sheltered waters between the passes to observe the movements of shipping in such times. Indeed, the great importance of the river mouth to the interests of the United States was the very reason for the acquistion of Louisiana by the United States. Obviously, for waters so closely associated with coastal nation interests, full jurisdiction over inland waters is needed, whether configurations change or not. Merely because some indentation for a time loses its semi-circle test configuration, is it to be said that it has lost its character as inland water, although we know the configuration necessary to satisfy the semi-circle test is quite apt to return? To say so, would cast natural resources development and leasing into chaos by the ever present threat that wholesale changes in title might follow. How much sounder it would be to recognize the Inland Water Line for what it is in law—the outer limit of inland waters—and thus totally avoid such undesirable consequences. If that is not done, would it not be the second best alternative to at least minimize the difficulties by applying the principle that waters which have been inland waters re-

main inland waters, by whatever name they may be called or whatever denomination the specification of the principle may bear.

Another interesting Louisiana situation, which will cause very substantial changes in sedimentation along the Louisiana shoreline, is the increased flow through the Atchafalaya Basin in modern times. In the last forty years, levee works, channel dredging and natural processes combined to enable the Atchafalaya to divert ever increasing volumes of flow *from* the Mississippi, via the Old River connection north of Baton Rouge—more than 25% in 1950, and greater volumes since that date. This increasing flow caused a very dramatic increase in the volume of sandy silt and fine sediments carried by the Atchafalaya, following channel improvements by the U. S. Engineers in the late 1920's. Great Mississippi flooding caused recognition of a need to enable the Atchafalaya system to regularly carry a substantial portion of the Mississippi waters. So the channel system was improved, not only for navigation, but also to enable it to safely carry away large volumes when the Mississippi threatened to flood the populated areas downstream.

The plan was that the Atchafalaya's processes, thus aided, would be able to naturally improve the flow capacity of the system, by filling in the lake system through which it flowed and gradually scouring a single deep, efficient channel with natural levees to further channel the flow. The result would be that

before too many decades, an efficient deep channel would flow all the way to the Gulf, thus greatly increasing the capacity of the system to carry off dangerous flood waters, and furnishing a deep navigational channel.

Two great studies prepared for the Mississippi River Commission show that the plan worked quite well—so well, in fact, that the Atchafalaya threatened to "capture" the Mississippi.[30] In the 20 or so years after the major works were undertaken, the Fisk report[31] showed 20 or more miles of land had been built (several miles wide for the majority of the distance) in the Grand Lake-Six Mile Lake system. Fisk predicted that an efficient channel "should be established from the head of the Atchafalaya distributary to Atchafalaya Bay by 1970-1975." [32] Fisk commented further:

> "At some time before the establishment of a single channel through Grand and Six Mile Lakes and before the Atchafalaya has reached a critical stage in diversion, delta building should be evident in Atchafalaya Bay. At the present time one-quarter of the suspended load of the Atchafalaya is carried through Lower Atchafalaya River into the Gulf. No estimates are avail-

[30] *The Atchafalaya River Study,* in three volumes, prepared for the Mississippi River Commission, under the direction of the Corps of Engineers (1951); and Fisk, *Geological Investigation of the Atchafalaya Basin and the Problem of Mississippi River Diversion,* prepared for the Mississippi River Commission (1952).

[31] *Id.* at plate 12, Vol. II.

[32] *Id.* at 135, Vol. 1.

able on the rate of filling of Atchafalaya Bay with these fine sediments but mudflats are beginning to blanket many of the sand beaches along the Louisiana coast west of Atchafalaya Bay. Oyster reefs along the coast have been buried by this wave of fine alluviation. Beaches at a former resort area at Cheniere au Tigre just west of Marsh Island are now isolated from the Gulf by extensive mudflats.

The growth of mudflats will be accelerated as capacity of the Atchafalaya channel to carry load develops. During the critical and final stages of diversion, coarse load should be introduced for the first time into Atchafalaya Bay. A delta similar to the Lafourche-Mississippi delta, with many, deep narrow distributaries fanning out in all directions, should be built into the shallow, marsh deposits of the bay . . . . The shallow depths which characterize Atchafalaya Bay and the Gulf south of Atchafalaya Bay, suggest a fairly rapid extension of the delta seaward, especially if dredging for navigation purposes becomes necessary." [33]

Although the diversion of the Mississippi was prevented by the Old River control structure (built in the 1960's as a result of these studies) the critical fact which would cause the delta growth was the completion of an efficient channel with capacity to carry the heavy sediments and an increasing proportion of the total sediment load to the Lower Atchafalaya mouth. By the Fisk estimates that time has now arrived or soon will arrive. The great feat of filling in a lake

[33] *Id.* at 138-140, Vol. 1.

system some 30 or more miles long and miles wide will now be duplicated, extending comparable areas out into the Gulf. The control project, it should be noted, was not of a nature and not intended to prevent the development of this channel which will build the delta. That channel was and is still desired to carry a major portion of the flow of the Mississippi for flood control and navigation. All that has been prevented is a total capture of the Mississippi, through prevention of uncontrolled increases.

As Fisk pointed out, this new delta will build seaward much more rapidly than the Mississippi because "The Mississippi River is discharging into water 300 ft. deep a few miles off Southwest Pass. The Atchafalaya must build its delta seaward nearly 50 miles before it can deposit its load in water as deep." [34]

As this delta advances rapidly (similarly although perhaps less rapidly than the mile per year growth in the lake system) if the Inland Water Line is not recognized as the coast line, we will see a belt of water three miles wide on either side of the new and advancing delta system change ownership. The exact path and width of the growth is difficult to predict. So, in effect, the future title over the next 5, 10, 30 or more years (to perhaps a swath of waters 10 to 15 miles wide by 15 to 20 miles or more into the Gulf) will be clouded. Each year new configurations, formed by the "many deep, narrow distributaries fanning out in all direc-

[34] *Id.* at 140, Vol. 1.

tions" which Fisk predicted, will pose geographic nightmares—and endless litigation before this very Court which will have to involve itself repeatedly in endless factual controversies.

Congress in passing the Submerged Lands Act could hardly have desired such endless litigation for the next thirty or more years. It would hardly be conducive to the great investments required for developing the oil resources in the path of the growth. Indeed, Congress specifically sought to avoid protracted litigation, and to solve, once and for all, the matter of ownership between the Nation and State in the resources of the Continental Shelf.[35]

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[35] "All agree that only Congress can resolve the long-standing controversy. . . . Interminable litigation has arisen. . . . The Committee deems it imperative that Congress resolve this needless controversy at the earliest possible date and bring to an end, once and for all, the confusion, chaos, inequities, and injustices that have resulted from the inaction of Congress." Report of House Judiciary Committee, H.R.Rep. No. 215 at 12, 13 83d Cong., 1st Sess. (1953).

The quoted report pointed out that development of offshore reserves was greatly hindered by the State-Federal ownership conflict, and the Submerged Lands Act was to overcome that problem and "finally and completely settle all issues between the United States and the States and their lessees." *Id.* at 14.

The report stated further:

"The committee deems it imperative that Congress take action at the earliest possible date to clarify the endless confusion and multitude of problems resulting from the California decision, and thereby bring to a speedy termination this whole controversy. Otherwise inequities, injustices, vexatious and interminable litigation, and the

The new delta is not all the havoc on the shoreline the new major channel to the Gulf will create. As Fisk noted, the finer sediments were already being carried to sea. Unlike the sands and silts of the heavy sediments that will form the delta, the very fine-grained particles are carried scores of miles to the west by Gulf currents. Some floculate in the salt water to form an ooze; some form great mud flats as at Cheniere au Tigre in a regular and progressive fashion, thus causing major portions of the western Louisiana shores to be dynamic and growing. In a study by Dr. Morgan and others, it is pointed out that a 60-mile stretch is affected by Atchafalaya mud being discontinuously swept onto the shores.[36]

Offshore, there are submerged masses of ooze, and along the western Louisiana coast, hurricanes have been known to cause one of the most unique of geological phenomena, not reported anywhere else in the world, which vividly indicate the dramatic dynamics of even our western shores due to the new and increasing impact of Atchafalaya sediments. Two great masses of mud, eight miles apart, were lifted by the fierce waves and hurled ashore, in forms

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retardment of the much-needed development of the resources in these lands will inevitably result." *Id.* at 37.

Numerous other items from the various committee reports, debates, and hearings could be cited, but the point is so clearly obvious it will not be belabored further.

[36]Morgan, Van Lopik and Nichols "The Occurrence and Development of Mud Flats along the Western Louisiana Coast," Technical Report No. 2 to the Office of Naval Research (1953).

Morgan styles "Mud Arcs." Both were in excess of two miles by 1,000 feet in width, and suddenly modified the location of the shoreline.[37]

Conclusion

There are many, many other details of great change that could be presented. But miles long mud arcs, a newly forming Atchafalaya delta, moving islands (vertically and horizontally), mud lumps and mud flats, ever advancing river mouths, cyclically dynamic interdeltaic complexes between the passes, hurricanes, river crevassing, disappearing and reappearing islands, enlarging bays, growing sand spits, disappearing peninsulas, and low sedimentary flat shores—all so frequently changed by wind and wave and river—show we have confusion in great profusion. To attempt to demark a coast line to stabilize title and thus promote full resource development on the basis of the facts present here is an absurdity, for while the intricate geographic or morphological forms may be litigated on the basis of a limited survey, supplemented by available data from other sources, litigation gives a practical result for only a brief moment in time.

The Interim Agreement ends with the decision this Court renders. With it goes the "buffer" between state-federal ownership claims. And if this Court renders a coast line decision based on shore line con-

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[37]Morgan, Nichols and Wright *Morphological Effects of Hurricane Audrey,* Coastal Studies Institute, Louisiana State University (1958), Technical Report No. 10 prepared for the Office of Naval Research.

figurations and locations, with it will go any chance for the stability and certainty of titles required for resource development, and both sides will lose, though their lawyers will win endless employment.

APPENDIX B

Parish of East Baton Rouge
Baton Rouge, Louisiana

Before me, Kenney L. Riley, Notary Public of East Baton Rouge Parish, State of Louisiana, duly appointed and qualified, on this 26th day of July, 1968, personally appeared at the place above named PROFESSOR JAMES P. MORGAN, who after being duly sworn, did depose and say:

I would like to discuss first some of the physical characteristics of the Mississippi River in comparison with other North American rivers. Within the continental United States there are 3 river systems that carry appreciable discharge and might be classified as major rivers. These consist, first, of the Mississippi; second, the St. Lawrence; and third, the Columbia River System. All other rivers are of much smaller magnitude and cannot be considered in the same general category. Of the three, the Mississippi transports, by far, the heaviest sedimentary load. Furthermore, the sedimentary deposits of the Columbia and St. Lawrence are discharged into the oceans and swept along the shore by relatively strong currents. Therefore, we find that neither of these rivers have been able to build a significant deltaic deposit within the latter part of geologic time. In contrast, the Mississippi by discharging into the protected Gulf of Mexico with its relatively low-wave energy and negligible tidal range, has been able to deposit an appreciable quantity of sediment

which has accumulated and formed a major deltaic deposit.

Smaller river systems of the Atlantic Coast include the Hudson, the Potomac, and the Susquehanna. All of these discharge their waters and sediments into relatively long estuaries left from the last glacial stage when the rivers were forced to scour deep valleys near their mouth. Since the last glacial stage these rivers have not carried sufficient load to fill their estuarine valleys. Along the Pacific Coast, only the Sacramento River discharging into the San Francisco Bay is of about the same magnitude. Again, in this case there has been no deltaic growth in to the Pacific Ocean.

In a slightly different category is the Colorado River which discharges into the Gulf of California. The latter is an elongate, estuarine-type water body although formed by a different set of geological conditions. Colorado River sediment has established a deltaic deposit within the Gulf of California of considerable size. Because this deposit has formed in the upper end of the elongate and much smaller Gulf of California, it is difficult to compare this with the Mississippi Delta which has built out into the Gulf of Mexico.

Finally, along the Gulf Coast a number of rivers should be mentioned. Second only to the Mississippi is the Rio Grande which has barely been able to fill its glacial stage estuarine valley and to develop a rather small extension of deltaic land into the Gulf. Other rivers, the Brazos of Texas, the Apalachicola of Florida, the Tombigbee and Alabama discharging into

the Mobile Bay, and the Sabine, Calcasieu and Pearl of Louisiana likewise, have not carried sufficient sediment seaward to be able to extend, or prograde their land masses into the Gulf.

Therefore, we find that on neither the Atlantic nor Pacific Coast has there been a river system capable of developing a deltaic deposit within the ocean proper. Along the Gulf Coast we have only two, the Mississippi, which has been exceedingly important in building its deltaic deposits and the Rio Grande, which has barely been able to prograde. The latter has not built a delta which is large enough to classify as being a significant land mass.

Therefore, we can conclude that within the contiguous 48 states of the United States we have no delta mass that can be compared with that of the Mississippi River. In other words, the Mississippi delta, and land forms associated with the delta are unique within the contiguous 48 United States. It is true that comparisons can be made between the Mississippi delta land forms and various small deltaic deposits that are fashioned in lakes, bays, and by very small rivers elsewhere; however, these are not features of the same size nor magnitude.

Next I would like to comment briefly on other major rivers of the world. The Mississippi is without doubt one of the major rivers of the world, and there are a number of others that are fairly well known and of comparable magnitude. Among these we might mention the Amazon, Orinoco and Parana of South Ameri-

ca, the Ganges-Brahmaputra, Indus, Irrawaddy and Mekong of Southeast Asia, the Yangtze and Hwang Ho of China; the Nile, Congo, Niger, and Zambezi of Africa and perhaps a few others of this same magnitude. All of these rivers discharge into water bodies which are subjected to differing tidal conditions and wave-energy conditions. The rivers all differ in their varying abilities to transport sediment with varying amounts of water during flood and low-river stage. Therefore, one would expect that the resulting deltaic deposits at the mouth of these rivers would differ to some degree depending upon their various abilities to transport and deposit sediments.

Because of variations in these different parameters: discharge, sediment load, wave energy, tidal currents, and so on, it would be surprising if major river deltas were identical. Comparative studies reveal that, although not identical, there are a number of similarities between some of these deltas. Some, however, such as the Amazon and Congo must be excluded. They are depositing their load in interior basins and that which reaches the coast is being swept away by extremely strong tidal currents. We find, then, that the Amazon, although the largest river on earth is not prograding its delta into the Atlantic Ocean. Others are more similar to the Mississippi: the Nile and the Niger have both been compared in some respect to the Mississippi River. The Ganges-Brahmaputra, discharging into the upper end of the Bay of Bengal, also has some deltaic characteristics that are similar to

those of the Mississippi, however, their differences are equally notable.

Before comparing these rivers we should consider the influence on deltaic deposition of sea level variations. 25,000 years ago, at the end of the last glacial stage, sea level was some 400 feet lower than at present. As glacial ice melted, ocean levels gradually came back toward the present position. Current information leads us to believe that sea level rose relatively rapidly following the last ice age until approximately 5,000 years ago. During the last 5,000 years sea-level has suffered only minor fluctuations. The fact that there has been a "still-stand" in sea level for the last 5,000 years has made it possible for rivers carrying sufficient sedimentary loads to fill up their estuaries and, in a few cases, to be able to transport sediment seaward to form a delta land mass. It is for this reason that small streams have not been able to prograde into the sea. There simply has not been sufficient time for these streams to fill their glacial stage estuaries and build seaward. Only those rivers carrying large sediment loads and discharging into water bodies with relatively minor current and wave energy have been able to prograde and fashion a delta mass. As mentioned earlier, the Amazon and Congo are not delta building rivers, whereas, the Ganges-Brahmaputra, the Irrawaddy, Nile and Mississippi are noted for their broad and fertile deltaic plains. In constructing their deltaic plains these rivers tend to shift their areas of deposition laterally back and forth, gradually building up an overlapping sequence of sedimentary layers which extend

progressively farther seaward. In nearly all cases this deltaic plain has been fashioned in the shallow waters of the Continental Shelf, marginal to the river mouth.

During the last 5,000 years the Mississippi River has constructed a broad deltaic plain on the Continental Shelf which extends from the vicinity of Marsh Island, Louisiana, eastward at least as far as the Chandeleur Islands of eastern Louisiana. This deltaic plain consists of some six or seven overlapping lobes of deltaic sediment which have been slowly extending themselves seaward, on top of, and laterally, from earlier deltaic lobes. By this process, the site of deltaic deposition has gradually prograded across the broad, gently sloping continental shelf off coastal Louisiana. Whereas, the older of these deltaic masses were deposited in relatively shallow water, the last of the lobes, represented by what we call the "bird-foot" delta, has developed well out on the Continental Shelf, actually within about 7 miles of the edge of the Continental Shelf. Water in this area prior to deltaic deposition was several hundred feet deep. Consequently the thickness of deltaic deposits in the "bird-foot" is much greater than in the older Mississippi River Deltas situated in the shallow waters of the inner Continental Shelf. Because of relatively deep water immediately offshore from the "bird-foot" distributaries we find that this delta has not constructed nearly as extensive a mass of sediment laterally as have previous deltas. Thus, the modern bird-foot Mississippi River Delta again is unique. In this particular case, not just within the confines of the continental United States, but indeed

unique throughout the world. This is the only known "bird-foot" delta associated with a major river.

The standard textbooks on geomorphology (the study of land forms) classify deltas in several different ways, but perhaps one of the most typical descriptions is that given in the text book *Geomorphology* by A. K. Lobeck. This text, published in 1939, has been an accepted standard for many years. In this particular book, the author classifies deltas into 3 types: *arcuate*, *estuarine*, and *birds-foot* (1st Ed., 1939, pp.230-234). For *arcuate* deltas, he uses as illustrations, the Ganges, the Irawadi (sic), and the Mekong as being typical arcuate-shaped deltas. For the *estuarine* type he uses as an illustration the Mackenzie, but points out several other illustrations where deltaic deposits are building into estuaries that were cut at a lower stand of sea level. We might interject here that the small deltas of the Sabine River and the Calcasieu River forming in Sabine and Calcasieu Lakes, respectively, are estuarine deltas as this general sort. Finally, in Lobeck's classification, the third type is the birds-foot delta, with the familiar illustration of the Mississippi. This particular classification is not at all unusual; many geomorphology texts use more or less the same approach in which deltaic land masses are classified by their surface or map configuration. In most of these, the "bird-foot" classification is used, but is applied only to the Mississippi, again suggesting the uniqueness of this particular sedimentary deposit.

In the text by Lobeck the second illustration used for the bird-foot delta type is the rather small and in-

significant delta of the St. Claire River which has a configuration generally similar to that of the bird-foot. However, this is a rather special case of a lake delta and cannot be considered in the same category as the rest of the continental margin deltas which we have been describing.

The earliest of the Mississippi delta maps all depict three major entrances to the River which probably agree with the three passes that were known when white men first came into the area. Because of the crude nature of map making in the early 1700's, we find that few of these early maps agree as to the length or the position of river mouth distributaries. Some of the early maps seem to be rather accurate, others are grossly inaccurate. The first actual survey of the delta mouth was made in Feb.-July, 1838 by A. Talcott-"At the Suggestion of the Special Board of Engineers." Talcott's map depicts the first accurate survey of the delta, though previous maps, by Dellafield and by George Gauld have some degree of accuracy though not surveyed. The Talcott 1838 map shows three major distributaries of the Mississippi River; the Southwest Pass, South Pass and as it was called, Northeast Pass. The latter is now called Pass a Loutre on most of our modern maps.

All of these distributaries were essentially natural and there had been no significant modification by man up to that particular time. Although the west bank of the river, north of Head-of-Passes was not surveyed by Talcott, it is known from other sources that there was a bay in that region not too dissimilar to Bay Ronde

on the opposite side of the river. East Bay, between Southwest and South Passes, and Garden Island Bay between South and Northeast Passes are open and very well developed according to Talcott's map. Subsequently, crevasses by the Mississippi River have filled much of the West Bay area, the Bay Ronde area, and Garden Island Bay. The only bay which has not filled through crevasse deposits is that of East Bay. Most of these crevasses took place prior to the time that the federal government of the United States (Army Corps of Engineers) was effectively supervising work and maintaining navigation within the delta proper. The only crevasse which has occurred within what we might call modern times is the Garden Island Bay crevasse which took place in 1891. The Corps of Engineers tried desperately to prevent the river from going into Garden Island Bay for the simple reason that they were interested in maintaining maximum river flow through South Pass in order to maintain a better and more navigable channel. They were unable to prevent the Garden Island Bay crevasse in 1891, but with improved techniques and engineering ability it has since been possible to control and prevent major crevasses.

In the year 1875, Captain James B. Eads commenced work on the artificial jetties at the mouth of South Pass of the Mississippi River. The purpose of the jetties was to improve navigation across the river mouth bar into the Port of New Orleans. There was considerable difficulty involved in getting permission and approval and financing to build the original jetties, but once they were completed near the beginning

of the 20th Century, they were eminently successful. So successful, in fact, that shortly afterwards the Corps of Engineers commenced construction of jetties at the mouth of Southwest Pass of the Mississippi River in the early 1900's. These jetties were finished in a relatively short period of time. Since that time South Pass and Southwest Pass both have been used for navigation into the Port of New Orleans.

The river-mouth jetties have a single purpose: to confine the flow of water into a narrower channel and thereby force it to scour more deeply across the river mouth bar. Jetties themselves narrowed the mouths of these passes. In order to make them effective, it is necessary to maintain as much water as possible between the jetties. For this reason the Corps of Engineers has attempted to maintain maximum flow into the Southwest and South Passes. This has caused them to build certain control structures at Head-of-Passes and also to close any major overflow channels from the two passes. Crevasses now are prevented as a normal maintenance procedure in the lower delta.

Two historic maps furnish most of our information about the "bird foot" delta prior to the time of Jetty construction. These are the map of 1838 surveyed by Captain Andrew Talcott; and the map of the lower delta entitled "Coast Chart #94, Mississippi River from the Passes to Grand Prairie, Louisiana," dated 1874. This latter map although published in 1874 includes information from surveys made at various times between 1857 and 1872. All of these data were put together on a single map which effectively shows

the geographic configuration of the delta immediately prior to jetty construction at South Pass by Captain James B. Eads.

I would like to make some specific comparisons between these two maps. You will notice that Southwest and South Passes and adjacent East and Garden Island Bays generally have the same configuration on the two surveys but that there are numerous minor differences. The mouths of both passes have changed somewhat during the interval and the irregular outlines of East Bay and Garden Island Bay have likewise changed. In places the changes reflect minor crevasses into the bays such as those labeled English Bayou, Franks Bayou and Long Bayou on Talcott's map. Other changes are a result of wave action eroding the bay shores. Because of the exceedingly low elevations of this delta land and the dynamic nature of both erosional and depositional processes surveyed, maps such as the two being discussed simply represent land-water configurations as of a specific moment in time.*

One land form of particular interest is the distributary branching into East Bay from South Pass known as Grand Pass or Grand Bayou. Although there are some differences in configuration of the mouth and banks of this distributary as shown on the two maps it is apparent that both depositional and erosional processes were taking place during this interval.

As a prelude to construction of the jetties, Captain

*Editors Note: The two maps referred to by Dr. Morgan are included in Exhibits 26 and 29.

Eads made numerous surveys and measurements of the South Pass distributaries. He established that South Pass was barely carrying 8% of the Mississippi flow reaching the delta, hardly enough water to support a jettied navigable channel. Therefore, as a part of the jetty construction project, Eads decided that more water must be made to reach the mouth of South Pass. Grand Pass was dammed at its point of divergence from South Pass. Two other engineering modifications were made by Eads; groins were constructed into the river at Head of Passes to funnel more water into South Pass and a small sand bar or island within the pass was dredged. In the course of these works, Eads was able to increase appreciably the percentage of flow through South Pass over the following twenty years. The increase significantly influenced the effectiveness of the jetties.

One definite aftermath of the engineering work involved the progressive destruction of Grand Bayou following closure by Eads. Once deprived of its water and sediment load, waves generated in East Bay attacked the natural levees of Grand Bayou, and by the mid-1920's most of this distributary had been destroyed, including mudlump islands at its mouth. This caused an increase in size of East Bay which in turn allowed generation of even larger waves. By the mid-1940's all evidence of Grand Bayou had been erased and the banks of South Pass in places were becoming exceedingly narrow as a result of wave attack from East Bay. It became necessary for the Corps of Engineers to resort to artificial bank con-

struction along South Pass and to a lesser degree in Southwest Pass in order to preclude additional breaches or crevasses into East Bay. To accomplish this, a number of shallow slips were dredged across the natural levees of both South and Southwest Passes into East Bay, and into West Bay as well. These were carefully protected with rip-rap (rock-rubble) so that water flowing through the small artificial canals could not erode downward and laterally, and lead to a crevasse but instead would transport suspended sediment from the river across the banks and tend to build them both outward and upward.

I think it is reasonable to state that either Southwest or South Pass would have crevassed into East Bay if it had not been for the necessity of maintaining maximum flow in both of the two passes for the purposes of navigation. Therefore, the lack of the development of a land mass comparable to the Garden Island Bay land mass, the Cubits Crevasse land mass, or the Jump land mass in East Bay is due, in great part, to the influence of man within the last eighty years.

I would like to discuss the various types of islands that are found along the Louisiana coast, especially that part of the coast that comprises the Mississippi River deltaic plain. In general, we can classify Louisiana islands as belonging to three different types, which we will consider systematically.

The first of the three types are those islands which are a product of erosional processes along the

coastal region; second, those which are of a depositional origin, that is, comprised of sediment which has accumulated in the near coastal region; and thirdly, those islands which are of a tectonic or structural origin.

Erosional islands are land remnants left by erosional processes associated with wave action. As mentioned previously the low coast of Louisiana reflects sediment deposition in the form of a series of deltaic land masses. Within a deltaic lobe there are minor differences in relief between adjacent parts of the delta. In the lower standing areas it is not uncommon for lakes or ponds to develop. As a result of wave action, these lakes or ponds usually enlarge by erosion along their margins. It is not at all unusual for such lakes or ponds through mutual enlargement to coalesce, forming larger lakes, and ultimately many of the latter become open to the Gulf and therefore might be more properly termed bays. The process of enlargement, coalescing and opening up takes place in periods of time which can be measured in decades, in some cases, or hundreds of years in other cases. Because the delta lobes that make up the plain are of various ages, that is, have been formed over the last 5000 years, we find that in different parts of the deltaic plain lakes, ponds and bays have reached various stages of development depending upon the age of the land mass with which they are associated.

A number of illustrations could be used, but let us take as an example the waterbodies that surround Marsh Island in the Central Louisiana coastal area.

Marsh Island is separated from the mainland by Vermilion Bay, West Cote Blanche Bay, East Cote Blanche Bay, and Atchafalaya Bay. These four bays are open, one into the other and yet they retain their separate and distinctive character. Originally, in prehistoric time, each of these bays was a separate entity. For example, East and West Cote Blanche Bays were formerly relatively large, round, marshland lakes situated to the interior of what is now Marsh Island. As they attained appreciable size, winds blowing across the water of these bays were able to generate successively larger waves which, in turn, caused bank erosion. Sometime before white man moved into Louisiana, East and West Cote Blanche Bays coalesced and became a single body of water. This water body, in turn, opened into Atchafalaya Bay to the east and Vermilion Bay to the west by similar processes. The latter was a more difficult situation for the reason that natural levees of one of the original courses of the Mississippi River formerly extended from Bayou Cypremort across the Bay, with one branch extending across Marsh Island and another to the west into Vermilion Parish. Wave erosion has, in part, removed the Bayou Cypremort levees, however, a reef or submerged ridge of land extends across this bay and is shown on hydrographic charts as Terrapin Reef. Coalescing of these bays then leaves Marsh Island as a land remnant surrounded on all sides by waters which are contiguous now with the Gulf of Mexico. Marsh Island then can be described as being a product of erosion, hence an erosional island. There are many

other such islands present in various places across the coast of Louisiana, but all originated in a similar fashion.

The second of the three island types found in coastal Louisiana can be called depositional islands. These effectively consist of three different sub-types. The first and most common type of depositional island consists of those which have developed from shoals through deposition of sediment at a river mouth. At the outlet of a river distributary the sedimentary load is deposited when the river meets the still waters of the Gulf of Mexico. This sediment accumulates just beyond the mouth of the channel and forms a river-mouth bar which gradually builds itself above sea level. Such shoals in the river-mouth bar are called "middle grounds" in South Louisiana. This term "middle ground" is derived from the island-like mass that developed in the mouth of Pass-a-Loutre of the modern Mississippi River Delta. With continuing sediment deposition the middle ground shoal at Pass-a-Loutre finally built above the level of the water and ultimately has developed into the relatively large land mass which divides North Pass from the extension of Pass-a-Loutre. Similar depositional processes at the river-mouth bar of each distributary have resulted in formation of the sub-deltas and the deltaic lobes that comprise the deltaic plain. Thus, the numerous distributaries of a delta delineate a number of islands that are essentially depositional in origin even though they may be somewhat modified by wave erosion processes.

The second type of depositional island includes

those which result from current and wave deposition of material eroded from the front of a deltaic land mass. Such depositional land forms are typified by the Chandeleur Islands of St. Bernard Parish, and the Timbalier Islands and Isles Dernieres complex of Lafourche and Terrebonne Parishes. Such islands are predominantly composed of the sand and shell remaining after finer grained materials, clays and silts, have been winnowed and removed by wave action. Ultimately these sandy deposits build above the level of the Gulf and fashion elongate islands of the barrier-island type. A particularly good illustration of this island-type are those of the East and West Timbalier Island complexes. These elongate, relatively narrow ridges of sand have been derived by wave erosion of the front of the recently abandoned Lafourche-Mississippi Delta. Deltaic deposition at the mouths of the Lafourche-Mississippi system created a relatively large land mass which was fashioned during the period of time from about one thousand years ago until some 300 or 400 years ago. Since that time the river has diverted to its bird-foot delta course and active deposition has ceased at the mouths of Bayou Lafourche. Wave action has become the dominant process, leading to rapid coastal retreat of the abandoned delta front. Winnowing by wave action has removed the finer particle sizes leaving the coarser material (sand and shell) to be reworked, concentrated and drifted alongshore to fashion barrier-type islands. The Timbalier Island complex derived from the eroding delta-front has been progres-

sively transported by littoral currents in a landward and westerly direction.

Let us consider specifically the progressive movement of the west end of Timbalier Island over the last 100 or so years. The earliest accurate survey of Timbalier Island was the Township Plat made in 1837-1838. The west end of the island at that time was rather well-defined and if we plot successive positions of the west end of the island at subsequent intervals of time, we see that it has moved in a general westerly and to some degree northerly direction. Successive maps made in 1887, 1932, and 1954 have been considered. In this interval from 1837 to 1954, we find that the west end of this island has progressively migrated a distance slightly in excess of 5½ miles to the west and slightly over a mile to the north. This movement has been progressive and gradual. We happen to have maps depicting four periods within this span of time, but the changes are of a continuing sort. The northwestward movement is a result of the prevailing waves which come from the southeast. This generates a longshore current which transports the reworked sediment in a westerly and somewhat northerly direction.

The third type of depositional island typical of the Louisiana coast includes those which result primarily from organic activity. These are best exemplified by the oyster reef-type islands that occur in the central Louisiana coast. The area westward from Point au Fer to and beyond Marsh Island is an area of the oldest of the modern deltaic masses, one which is generally

called the Salé-Cypremort Delta Complex. This deltaic land mass achieved maximum development about 5,000 years ago and was abandoned about 4,600 years ago. Since that time, the deltaic lobe has gradually subsided below the level of the Gulf of Mexico and was in part inundated by the slight increase in sea level that has subsequently occurred. Following abandonment, this delta has served as an ideal foundation for the development of relatively extensive oyster reefs. Oysters growing in this area have formed relatively large reefs which have built upward to high-tide level, keeping pace with the slow rise of sea level. Scattered throughout this area are a number of small masses of oyster shell that sometime extend above the mean high-water level. These result from the action of waves which tear oysters from the reefs and pile them above the surface of the water. The oyster-reef islands typical of this region, then, are depositional and consist of loose oyster shell piled on top of reef masses.

The high points of such islands are changeable in nature. However, the reef structures upon which the loose shells are deposited are often quite extensive and permanently above mean low-water level. Thus, while the extent of material above mean high-water may be small, the extent of reef exposed at mean low-water is often quite large. For example, map 3 of the set of 5 maps in the set of 54 maps, prepared by the U. S. Coast and Geodetic Survey, from 1960-61 work, shows an elevation 1.3 feet above mean high-water at X=1,899,-110; Y=282,309. The area of the elevation at mean high-water was small, as shown by a small solid line

on the map. However, the area of the island at mean low-water is shown as having dimensions of approximately 150 feet by 1,200 feet. Storms or hurricanes may remove the loose materials forming the high points of these islands or they may add to the elevations, depending upon wave size, direction, intensity, etc. The Shell Keys reef, offshore from Marsh Island, is an exceptionally massive, elongate ridge of oyster shell that has been piled up by wave action to elevations of 5 or 6 feet above mean high-water level. Reefs, such as the oyster reefs mentioned here, are typical of many delta areas. In more tropical parts of the world, coral reefs attain extensive development in such environments but are not typical of the Louisiana coast.

We might summarize, then, and point out that the depositional islands of the deltaic part of coastal Louisiana consist of first, the shoals or middle-ground-type islands; second, the current and wave-formed sandy islands such as the Isles Dernieres and Timbalier Island complex; and thirdly, the oyster-reef islands of central coastal Louisiana.

The third major island type include those which have been described as being of tectonic or structural origin. In coastal Louisiana these consist of *mudlumps* which develop at the active mouths of the distributaries forming the bird-foot delta. Of the three island-types, mudlumps are unique to the Mississippi Delta. They are associated with the principal distributaries which have built out into deep water near the edge of the continental shelf. Here, relatively thick sedimentary deposits accumulate on the river-mouth bar asso-

ciated with the mouths of Southwest Pass, South Pass and the several mouths of the Pass a Loutre system. Processes leading to the formation of mudlump islands are directly associated with the thick, massive deposits of the river-mouth bar at the mouths of each of these major distributaries. The heavy load of sands, silts and clays at the mouths of the distributaries overlie relatively plastic and fine-grained sediments that had been previously deposited on the continental shelf in this particular region. Relatively coarse and massive sand and silt deposits overlying plastic clays lead to an unstable condition. The plastic clays flow from beneath the site of loading much as toothpaste is squeezed from a tube. The plastic clays flow seaward from beneath the river-mouth bar and work their way upward, ultimately forming islands which extend above the surface of the Gulf of Mexico. Such mudlump islands are associated directly with sites of active deposition. As the distributary mouth extends itself seaward, new mudlumps continue to develop immediately seaward from the river-mouth bar. The older mudlumps are incorporated into and become an integral part of the prograding deltaic distributaries.

As mentioned previously, the bird-foot delta of the Mississippi River is unique in that it has prograded well out towards the edge of the continental shelf. This has caused relatively thick river-mouth bars to develop at the mouth of each distributary. These, in turn, sink into the underlying plastic clays beneath and cause the latter to be extruded in the form of the mudlump islands. Thus, mudlump *islands* themselves are indica-

tive of the bird-foot delta—they are unreported from any other delta. There have been some reports that mudlump-type intrusions are present as submarine features at the front of other deltaic land masses: only in Louisiana, however, at the mouth of the bird-foot delta do they form islands; islands which reflect deltaic progradation into deep water. I would like to refer to a publication by James P. Morgan, James M. Coleman, and Sherwood M. Gagliano entitled "Mudlumps at the Mouth of South Pass, Mississippi River; Sedimentology Paleontology, Structure, Origin and Relation to Deltaic Processes." This publication of the Louisiana State University Studies, Coastal Studies series #10, was published in 1963 by the Louisiana State University Press. In particular I would like to call attention to Figure 4 in this publication, on page 13, which shows progressive sites of mudlump development at South Pass from the 1860's to the early 1960's. This diagram shows that there has been a general southerly development of mudlump islands progressively farther seaward at the mouth of South Pass. This process reflects the gradual extension of the sediments at the mouth of that pass in a southerly and slightly westerly direction. We can anticipate that the changes of the past 100 years will be continued into the future. The mouth of this pass and the resulting mudlumps will continue to extend in a south-southwesterly direction over the years to come, barring any change in the amount of water and sediment being carried by South Pass. In the same publication, figures 12 and 13 (pp. 46-49) show hypothetically the progradation of a river-mouth

bar and the subsequent development of mudlumps. The sequential diagrams here show the birth and death of these mudlump islands and the way in which they are incorporated in the seaward prograding mainland.

I would like to summarize the previous discussion of islands that develop along the Louisiana coast. Three types of deltaic islands have been described: erosional, depositional, and tectonic. All of these island-types have one thing in common, they are relatively ephemeral; they change rapidly with time. In Louisiana we must recognize the dynamic nature of coastal landforms which change rapidly. Such rapid changes of land configuration are more typical of deltaic areas, than of non-deltaic coasts. It should be pointed out that these conditions are not duplicated along the Atlantic or Pacific coasts of the United States where rocky, cliff-like coasts are more common and deltas are small and localized and usually situated at the heads of estuarine valleys.

Most of the previous discussion has pertained to the rapid development of deltaic coastal land forms, and the relatively rapid rates of changes of these land forms. A second factor that influences deltaic Louisiana is the continuing effect of subsidence or sinking of coastal landforms. The deltaic plain is composed of fine-grained sediment, predominantly clays and silts with a relatively small proportion of sand and shell. Such deposits retain a high water content in intergranular pore spaces following deposition. As deltaic deposits accumulate there is a general tendency for the interstitial moisture to be driven out of the sediments

by compaction. Water loss by compaction continues after a deltaic system is abandoned by river diversion. Therefore, the process of subsidence continues even after the deltaic distributaries cease their seaward progradation. A cycle of deltaic sedimentation, then, consists of a period of relatively rapid lateral and forward build-out of sediment followed by an interval of slow and gradual subsidence, with resulting development and enlargement of lakes, bays, and ponds. This process is graphically illustrated by the history of the West Bay area of the modern bird-foot delta. A sub-deltaic land mass covering some 100 square miles was constructed very rapidly following the year 1838 when The Jump broke into a rather open and much larger bay. The resulting land mass achieved its principal size by the late 1880's. And by the early 1920's there was very little build-out of that land mass. About this time, subsidence became the dominant process. Subsequently, the lakes, ponds, and bays between the various distributaries, have been enlarging at the expense of adjacent levees and marshland. Much of the former marshland has been converted to shallow, coalescing lakes and bays.

Detailed studies based on a number of core holes through the West Bay area reveal that there have been at least three phases of deltaic deposition followed by subsidence within the area that we now recognize or call the West Bay region. The first of these apparently took place in the late 1600's, or early 1700's when a mass of sediment extended into this region from the Mississippi River in the vicinity of what is now known

as Dry Cypress Bayou. The resulting sub-delta slowly subsided and by the early 1800's a second mass of deltaic sediment built into this area from the Mississippi River in the area that is now called "Bayou Grand Liard." The Liard land mass had completed its period of build-out by the early part of the 1800's. A military report, written in 1818, describes this area as being far gone into the phase of subsidence and deterioration. By 1838 the area had subsided again and consisted of large lakes and bays with a few small islands of marsh. The crevasse into this West Bay area in 1838 was called The Jump. As mentioned previously, this land mass has been deteriorating since the 1920's and within another 20 to 30 years the present land area will become a much larger open bay subject to a future depositional cycle if the river would be allowed to crevasse naturally. Thus, we can see that a delta, such as the bird-foot delta, is composed of a series of small, overlapping wedges of sediment built at intervals that can be approximately measured in hundred-year increments. Similarly, we can point out that the older deltaic lobes which comprise the Mississippi River deltaic plain likewise formed from a series of smaller subdeltaic sediment masses which have built up one on top of the other.

/s/JAMES P. MORGAN

Sworn to and subscribed before me this 26th day of July, 1968.

/s/KENNEY L. RILEY
(SEAL) Notary Public

VITA—JAMES PLUMMER MORGAN

Born: Beaumont, Texas, December 2, 1919

Parents: Hugh Davis Morgan and Pauline L. Lauve

Married: 1945 to Dorothy J. Skinner.
Three children: James Davis, b. 1946; David Joel, b. 1948; Michael Leander, b. 1956

Education:
Primary and Secondary: Pasadena, California
Junior College: Pasadena Junior College
Undergraduate: A.B. degree in Geological Sciences, University of California, Berkeley, 1943

Military Service:
U. S. Army Air Force, 1943-1946; Aerial Photographic Officer

Graduate Education:
Louisiana State University, Baton Rouge, La., 1946-1951. Ph.D. degree in Geology awarded June 1951

Academic Career:
Teaching Assistant, 1946-1947, Louisiana State University
Instructor, 1947-1951, Louisiana State University
Assistant Professor, 1951-1954, Louisiana State University
Associate Professor, 1954-1962, Louisiana State University
Professor, 1962-date, Louisiana State University

Academic Subjects:
Physical Geology, Historical Geology, Subsurface

Geology, Coastal and Alluvial Morphology, Deltaic Geology, Marine Geology.

Other Professional Activities:

Managing Director, Coastal Studies Institute, Louisiana State University, 1953-1966.

Editor, Coastal Studies Series, Louisiana State University Press, 1958-1966.

Consultant to Louisiana State Attorney General on "Tidelands Problems," 1953-date.

Consultant to Naval Ordnance Testing Station, China Lake, California, 1964, on Mekong Delta.

Expert Witness and Consultant on numerous legal problems regarding fluvial, deltaic and coastal land changes.

Editor, S.E.P.M. Volume on Deltaic Geology.

Professional Societies:

Fellow, Geological Society of America; Member, American Association of Petroleum Geologists; Member, American Association for the Advancement of Science; Sigma Xi; Theta Tau.

Publications:

a. Books

Morgan, James P., *Genesis and Paleontology of the Mississippi River Mudlumps*, Part I, "Mudlumps at the Mouths of the Mississippi River," *Geological Bulletin No. 35*, Department of Conservation, Louisiana Geological Survey, Baton Rouge, Louisiana, 1961, 116 pages and plates.

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and S. M. Gagliano) Louisiana State University Studies, Coastal Studies Institute Series No. 10, University Press, Baton Rouge, La., 1963, 190 pages and figures.

b. Monographs

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c. Articles

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Morgan, James P. and Treadwell, R. C., "Cemented Sandstone Slabs of the Chandeleur Islands Louisiana," *Journal of Sedimentary Petrology*, Vol. 24, No. 2, June 1954, pages 71-75.

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man and S. M. Gagliano), In Press as part of A.A.P.G. Symposium Volume on *Diapirism.*

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Morgan, James P., "Research Activities and Future Plans of Coastal Studies Institute," First National Coastal and Shallow Water Research Conference, Tallahassee, February 1962, pages 452-454.

Current or recent projects of significance, and grant awards:

Recent sediments of the Louisiana Continental Shelf for Gulf University Research Corporation, Grant.

Grant from United States Geological Survey, Office of Marine Geology and Hydrology for a Geophysical Study of Structure, Stratigraphy and Sediment Distribution on the Louisiana Continental Shelf.

APPENDIX C

ISLANDS IDENTIFIED ON INFRARED PHOTOGRAPHY FLOWN AT MEAN HIGH WATER IN THE ATCHAFALAYA BAY MARSH ISLAND AREA, LOUISIANA

Prepared for

TIDELANDS STAFF
STATE OF LOUISIANA

By

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ISLANDS IDENTIFIED ON INFRARED PHOTOGRAPHY FLOWN AT MEAN HIGH WATER IN THE ATCHAFALAYA BAY MARSH ISLAND AREA, LOUISIANA

The infrared photography used for the identification of islands above water was flown by the United States Coast and Geodetic Survey on May 3, 1961 at the time of mean-high-water. The photography was flown at scales of 1:20,000 and 1:10,000 and contact prints at each scale were examined by stereoscopic methods to define the land forms or islands above water and the submerged land forms or shell reefs. These features are shown on the accompanying film base map and paper prints titled "United States of America V. State of Louisiana Et Al-No. 9, Original Motion of United States For Supplemental Decree (No. 1) Exhibit 2 - Marsh Island, Atchafalaya Bay-Eugene

Island Area" and on film overlays of mosaics prepared by Jack Ammann Photogrammetric Engineers of San Antonio, Texas. The mosaics were prepared from air photographs flown in 1953-1954 according to Mr. Fredrick W. Ellis. The islands and submerged shell reefs are identified on the films and prints by numbers and colors explained in the legend on each film and print.

Infrared photography is designed to provide a high contrast between land and water provided that a suitable filter is used. When infrared film currently employed for the determination of land-water boundaries is exposed in a camera equipped with a Wratten 88, a filter which filters out all wavelengths less than 750 millimicrons, only the infrared light between 750 and 900 millimicrons reaches the film. Under these conditions, the water appears very dark and there is little or no water penetration and the land areas are light in tone.

The infrared photography flown by the United States Coast and Geodetic Survey was probably made from Kodak High Speed Infrared Film which is sensitive through the visible regions of the spectrum (400 to 700 millimicrons) and in the infrared to approximately 900 millimicrons with a maximum sensitivity in the region of 770 to 840 millimicrons. The overall appearance of the contact prints suggests that a technique of exposing infrared film in a camera equipped with a minus blue or Wratten 12 filter, which filters out all wavelengths less than 500 millimicrons, was used. This technique permits both visible and infrared

light between 500 and 900 millimicrons to reach the infrared film. Because a major portion of the visible and the infrared reaches the film, submerged land forms or shell reefs are evident on the contact prints, while the water-versus-land contrast is not as sharp.

There is an excessive amount of static electricity evident on the otherwise average quality contact prints. This phenomenon is caused by rapid film advance or low film humidity due to prolonged refrigeration. The static electricity is expressed on the contact prints as white, linear and dendritic lines in zones approximately two inches in width transverse to the flight line across the central portion of the prints. There are also local zones of static electricity along the edges of some prints parallel to the flight line. The static electricity expressed as light-toned linear and dendritic lines cannot be confused with the shell reefs. However, they could obscure small emergent reefs. The excessive amount of static electricity places the contact prints in a substandard category. Good stereoscopic vision is difficult to obtain between some of the overlapping prints.

The examination of the infrared photographs was initiated in May, 1966. This study consisted of the determination of all islands above mean-high-water and their location with respect to the shell reefs shown on the film base map Exhibit 2, which shows the configuration of the shell reefs at low water. Many of the islands could not be located with sufficient accuracy as their size and configuration could not be related to the larger features shown on Exhib-

it 2. Scale differences between the contact prints and the film base map at 1:20,000 scale prevented accurate map location even using oil well installations visible on the photographs. In using Exhibit 2 as an overlay of the photographs while locating the islands, it became evident that the submerged shell reefs visible in most instances with the naked eye, generally coincided in size and configuration to the reefs on Exhibit 2. The contact prints were examined again stereoscopically and the submerged reefs outlined in detail. At the same time, the crests of the submerged reefs, which are sharp and readily distinguished on most of the features, were noted and marked. Exhibit 2 was placed on each contact print and the configuration of the submerged reefs was fitted to the reefs shown on Exhibit 2. This method greatly increased the accuracy of locating the islands identified above mean-high-water. However, the location of several islands was still questionable as a result of the lack of complete configuration of some submerged reefs or the lack of sufficient legible detail on Exhibit 2 for comparison.

The results of the examination were submitted to the Tidelands Staff for study. In August, 1966 a conference was held in Baton Rouge, Louisiana to review the initial study and evaluate the islands interpreted as being above water. Mr. Fredrick W. Ellis of the Tidelands Staff; Dr. James P. Morgan, Professor in the School of Geology, Louisiana State University, and a recognized authority on the geologic features of Coastal Louisiana; and the writer, Curtis

L. Buttorff of Geophoto Services, Inc., a geologic consulting firm of Denver, Colorado, reviewed the initial study.

Dr. Morgan reviewed his study and examination of shell reefs of Coastal Louisiana over a span of fifteen years. The review included the character of the reefs that he had visited throughout this period and the probable disappearance of portions of some reefs as a result of dredging or hurricanes. Dr. Morgan referred to the mosaics made by Jack Ammann Photogrammetric Engineers from air photographs flown in 1953-1954. The photography and mosaics were prepared for the State of Louisiana. The photography was taken at a low water time and the shell reefs are very sharp and clear. The higher portions of the reefs are white in tone and contrast with the remainder of the visible portion of the reef. The configuration of the submerged reefs traced on the infrared photography is in close agreement with the shell reefs on the Ammann mosaics. The outline of the submerged reef is generally broader than the emergent reef. The crest of the submerged reefs, where visible, agree very closely with the white, higher portions of the reefs on the Ammann mosaics. The higher standing portions of the reefs on the mosaics also agree very closely with the United States Coast and Geodetic Survey low-water photography flown in 1960 and the shell reefs mapped and surveyed on Exhibit 2.

The configuration and crests of the submerged reefs annotated on the infrared photographs, when

superimposed on the Ammann mosaic, greatly enhanced the accurate location of the islands selected as being definitely or probably above mean-high-water. All of the islands are believed to be in their correct location or within a few tens of feet with respect to the shell reefs on the Ammann mosaics and Exhibit 2.

The shell reefs visible on the Ammann mosaics made from 1953-1954 low-water photography and the submerged reefs visible on the 1961 infrared photography agree closely in size and configuration. High points on the reefs are identical in several instances. At location 1 on Exhibit 2 and mosaics L48 and L49 the high points of the emergent reef on the mosaic and the crest of the submerged reef on the infrared photographs are virtually identical. The permanency of the reef structures from 1953 through 1961 is obvious through the comparison of reef structures visible on photography flown those years. The width of the submerged reef is often double the width of the reef above water indicating the reef increases rapidly in size at a very shallow depth and has attained its present height over a long period of time or is growing on a near-surface shoal.

A review of all of the islands interpreted as being above mean-high-water on the initial study of the Atchafalaya Bay area was made by Dr. James Morgan and Curtis Buttorff. Each location was examined to determine if the island was located on a reef; if it was visible on both the 1:20,000 and 1:10,000 scale photographs; and if there was any possibility that the

light-toned areas, interpreted as islands, resulted from surf breaking over a near-surface reef. The islands were classified as being "definitely", "probably" or "possibly" above water. Islands not associated with a submerged reef or a reef visible on the Ammann mosaics were eliminated from consideration even though several apparent islands are visible on both sets of photographs. The islands classified as possible were eliminated so that the only islands shown on Exhibit 2 and mosaic overlays L47, L48 and L49 are associated with submerged or emergent reef and are classified as being "definitely" or "probably" present and above mean-high-water. These islands are shown on Exhibit 2 and on mosaic overlays L47, L48, and L49 and identified by numbers 1 through 12. The islands are inked solid and the outlines of the submerged reefs are colored yellow on the paper prints of Exhibit 2 and the mosaic overlays.

The islands at the following locations are shown on Exhibit 2 which consists of the film base map, and paper prints on the film base map. The islands are also located on the mosaic overlays. The following locations refer to the Lambert Plane Coordinate Grid, State of Louisiana, South Zone as shown on Exhibit 2 and the Ammann mosaics.

Location No. 1

Classification: Definite
X =1,887,000 Ft.
Y = 295,500 Ft.
1:20,000 contact prints 1761, 1762, 1763.
Mosaic Nos. L48, L49.

The basic reef structure on the 1953-1954 and 1961 photography appears the same. Crest lines of the submerged reef have the same configuration as the reef on the Ammann mosaics. The island is located on one of the high points of the reef shown on mosaic L48 and L49.

Location No. 2

Classification: Definite
X = 1,896,700 Ft.
Y = 289,900 Ft.
1:20,000 contact prints 1764, 1765 and 1747, 1746 and 1745.
Mosaic No. L48

The island is crescent shaped and located slightly north of the crest line of the submerged reef which is coincident with the high point of the reef on mosaic L48.

Location No. 3

Classification: Definite
X = 1,887,400 Ft.
Y = 288,000 Ft.
1:20,000 contact prints 1748, 1747
Mosaic No. L48

The platform and pilings of the Humble No. 1 are visible on the contact prints. The shell reef is visible west of the platform.

Location No. 4

Classification: Definite
X = 1,900,600
Y = 289,900

1:20,000 contact prints 1764, 1765
Mosaic No. L48

The Y shaped island is located on a reef that appears to be partially awash.

A submerged reef that coincides with a reef on mosaic L48 is traceable south of the island. The configuration of the submerged reefs in this area agrees closely with the reefs on mosaic L48.

Location No. 5

Classification: Definite
X = 1,899,000 Ft.
Y = 282,100 Ft.
1:20,000 Contact prints 1745, 1744
Mosaic No. L48

The island is shaped like a fish hook and is located on the crest of a submerged reef that coincides closely with the configuration of the reef complex visible on mosaic L48. The island is approximately 1400 feet north of Texaco Well No. 26. The hook-shaped island is readily visible on the 1:10,000 scale contact prints 1825 and 1826.

Location No. 6

Classification: Probable
X = 1,900,000
Y = 281,700
1:20,000 contact prints 1745, 1746
Mosaic No. L48

The island is classified as probable because stereoscopic vision is blurred. However, the island is visible with the naked eye and is located on the crest of a

submerged reef that coincides almost precisely with a reef visible on mosaic L48.

Location No. 7

Classification: Definite
X = 1,906,400 Ft.
Y = 284,300 Ft.
1:20,000 contact prints 1745, 1744, 1743
Mosaic L48

The island is located on the west end of a prominent submerged reef that agrees very closely with the complex configuration of the reef on mosaic L48. The island cannot be identified on the mosaic because of a join in the photography.

Location No. 8

Classification: Definite
X = 1,905,150 Ft.
Y = 282,650 Ft.
1:20,000 contact prints 1745, 1744, 1743
Mosaic No. L48

The island is clearly visible and located on a submerged reef that cannot be completely outlined because of the static electricity which prevents good overall stereoscopic vision. The general reef complex is visible on mosaic L48.

Location No. 9

Classification: Definite
X = 1,905,300 Ft.
Y = 281,350 Ft.
1:20,000 contact prints 1744, 1743
Mosaic No. L48

The island is sharp, located on a submerged reef

and reefs that are partially awash. The submerged and emergent reefs coincide with portions of the reef on mosaic L48.

Location No. 10

Classification: Definite
X = 1,906,400 Ft.
Y = 281,100 Ft.
1:20,000 contact prints 1744, 1743
Mosaic No. L48

The island is readily visible on a reef that is partially awash and within the outline of a submerged reef that encloses the visible reef on mosaic L48. The island is located on a high point of this reef. Lines of foam or turbulent water streaming around and away from the island indicate the island is well above mean-high-water.

Location No. 11

Classification: Definite
X = 1,907,650 Ft.
Y = 281,600 Ft.
1:20,000 contact prints 1744, 1743
Mosaic No. L48

The island is clearly visible at the southern end of a shell reef partly awash. The island is along the edge of the outline of a submerged reef that encloses a reef complex visible on mosaic L48.

Location No. 12

Classification: Definite
X = 1,916,750
Y = 275,600

1:20,000 contact prints 1741, 1742
Mosaic No. L47

The island is located on a long shell reef that is partially awash. It appears to be located on a submerged reef. However, wave action obscures the outline of the submerged feature so it is not shown on the maps or mosaics. The submerged reefs adjacent to the island correspond very closely in size and configuration to the reefs visible on mosaic L47. The island is located on a join line between photographs on the mosaic and there is no reef visible in this location on the mosaic. The island is approximately 75 to 100 feet long and 20 feet wide. This is probably Hayne's Island noted as "bares 1.3 feet" on photo 60L863, a reproduction.

Twelve islands are determined to be above mean-high-water on the infrared photography flown at scales of 1:20,000 and 1:10,000 by the United States Coast and Geodetic Survey on May 3, 1961. In the opinion of Dr. James P. Morgan and Curtis L. Buttorff, eleven of the islands are definitely above mean-high-water. The island at Location No. 6 on Exhibit 2 and mosaic overlay L48 is classified as probably above mean-high-water. These twelve islands are also closely associated with visible shell reefs and/or submerged reefs that are coincident in configuration and location with shell reefs visible on the mosaics prepared from air photographs flown in 1953-1954 by Jack Ammann Photogrammetric Engineers. This close coincidence of the reefs, even intricate and complex portions of some reefs, firmly establishes that most

of the reefs were permanent features during the period 1953-1954 and May 1961.

Respectfully submitted,

GEOPHOTO SERVICES, INC.
/s/ CURTIS L. BUTTORFF

APPENDIX D

Commonwealth of Australia
State of Victoria
City of Melbourne
Consulate General of the United States of America
Australia,
Clayton, Victoria
} S.S.

Before me, undersigned Edward G. Murphy, Consul of the United States of America, duly appointed and qualified, on this 24th day of July, 1968, personally appeared at the place above named PROFESSOR ALEXANDER MELAMID, who after being duly sworn, did depose and say:

My opinion has been requested as an expert geographer concerning certain geographic questions which relate to the selection of natural entrance points in the vicinity of the waters known as East Cote Blanche Bay and Atchafalaya Bay in the central Louisiana coastal area. My qualifications as an economic geographer and experience in geographic boundary determination problems are more fully reflected on Exhibit A attached hereto which describes my professional qualifications and publications. My experience has included study of an application of the principles of boundary determination and baseline determination of the Geneva Convention on the Territorial Sea and the Contiguous Zone.

During the past two years I have made repeated visits to Louisiana for the purpose of studying its

coastal configurations and conditions. In addition to the examination of extensive map collections which reflect the hydrographic and topographic facts in the subject area, I have inspected the conditions of the area from surface craft and from aircraft. My study of map collections has included an examination of the set of 54 maps known as "low-water survey maps," prepared by the United States Coast and Geodetic Survey, which has been referred to and employed by the United States and the State of Louisiana in the litigation styled *United States v. State of Louisiana*, Number 9 Original, Supreme Court of the United States. References hereinafter made employ these maps and the Louisiana Plane Coordinate System, South Zone, to identify the locations discussed.

By application of the geographic concepts employed in the Geneva Convention on the Territorial Sea and the Contiguous Zone it is my professional opinion that the waters shoreward of a line drawn between the points X=1,987,371; Y=241,272 andX= 1,855,055; Y=296,154 constitute a bay. The point X= 1,987,371; Y=241,272 is the outermost natural entrance point of the bay on the east. This point lies on a quite substantial oyster-reef formation exposed at mean low-water just to the southwest of Point au Fer. At low-water stage, the stage at which the perimeter of a bay is to be determined under Article 7 of the Convention, this reef formation is quite extensive and pronounced. Even at high-water stage, the reef complex between X= 1,987,371; Y=241,272 and Point au Fer effectively

precludes entrance into Atchafalaya Bay landward of the point just described by coordinates. There are only negligible openings—useless for safe navigation—between the described eastern natural entrance point and Point au Fer, in the maze created by slightly submerged oyster reefs and emergent low-water elevations. Passage into the bay from the Gulf of Mexico is feasible only to the west of this natural entrance point on the east. Moreover, the reef structure complex is geographically a natural extension of the Point au Fer mainland.

The western natural entrance point to the bay which includes the waters commonly known as East Cote Blanche Bay and Atchafalaya Bay, occurs at the southern extremity of a group of islands, low-tide elevations, and reef structures extending seaward from Marsh Island. These islands, low-tide elevations, and reefs, known collectively as the Shell Keys, quite graphically appear as a natural extension or integral part of the Marsh Island form. The point which I have described above as the western natural entrance point, at X=1,834,019; Y=270,301,is at the pronounced southern terminus of this extensive and tightly grouped mass of elevations. As a practical matter, east-west navigation across or through the Shell Keys is certainly impractical and probably impossible. The only way to enter from the western side of the Shell Keys is to come around the tip of the Shell Keys complex, which must be considered as the western natural entrance point.

Because a line between the two points just de-

scribed exceeds 24 miles, the closing line must be moved to a position at which it encloses the maximum amount of water possible with a line of 24 miles length. This properly can be done by moving the western terminus of the bay closing line from the southernmost extension of the Shell Keys complex to the point between Mound Point and South Point on Marsh Island identified by the coordinates X=1,855,055; Y=296,154.

Because this bay formation is an "overlarge bay," the 24-mile closing line need not be described between natural entrance points. The line which employs the point between Mound Point and South Point on Marsh Island identified as X=1,855,055; Y=296,154, is a pronounced shoreline formation and would qualify independently as a natural entrance point of the overall indentation even though it is not required that headlands or natural entrance points be employed in the demarcation of the 24-mile line for an over-large bay. It should be noted that the line employing this point is not precisely 24 nautical miles long, but is approximatly that distance. The actual distance is a fraction of a mile less than 24 miles. This results from the fact that the shoreline to the west of X=1,855,055; Y= 296,154 turns inward and it would be a geometric impossibility to extend the line to precisely 24 miles.

Although its status as an over-large bay obviates any necessity for meeting the semi-circle test as to the area inside the 24-mile line, the waters behind the 24-mile line exceed the area of a semi-circle having the diameter of 24 miles.

Of course, in addition to the territorial sea pro-

jected by the mainland bay discussed above, it is appropriate to employ as base points within the territorial sea any and all low-water elevations which are located within the breadth of the territorial sea, as generated by the mainland or islands. I have made no attempt in this opinion to describe the location of points seaward of the closing line of the bay which might have the further effect of extending the three-mile belt under the provisions of the Geneva Convention on the Territorial Sea and the Contiguous Zone.

Because of the factors discussed above it is my opinion that the proper treatment to be afforded Atchafalaya Bay under the Geneva Convention on the Territorial Sea and the Contiguous Zone is that proposed by Louisiana in her Response and Opposition to the Counter-Motion of the United States.

/s/ ALEXANDER MELAMID

Witness my hand and official seal this 24th day of July, 1968, at Melbourne, Australia.

/s/ EDWARD G. MURPHY
Consul of the United States of America.

(SEAL)

Attachment A

PROFESSIONAL QUALIFICATIONS OF ALEXANDER MELAMID

Permanent Position:

Professor of Economics,
New York University,
NEW YORK, N.Y. 10003. U.S.A.

Visiting Position:

Professor of Economic Geography,
Monash University,
CLAYTON. Victoria 3168, Australia.

Fellowship of Scientific Societies:

Royal Geographical Society,
LONDON, England.

American Geographical Society,
NEW YORK, U.S.A.

Association of American Geographers,
WASHINGTON, D.C. U.S.A.

Field of Activity:

Economic and Political Geography (especially relating to the impact of boundaries on economic development both onshore and offshore).

Major Publications Relating to Political Boundaries:

In the Geographical Review, New York.

"The Political Geography of Trucial Oman and Qator," 1953.

"The Economic Geography of Neutral Territories," 1955.

"The Geographical Distribution of Communities on Cyprus," 1956.

In the Annals of the Association of American Geographers.

"The Political Geography of the Gulf of Aqaba," 1958.

In the American Journal of International Law.

"Legal Status of the Gulf of Aqaba", 1959.

In the Journal of Geography.

"Partitioning Cyprus", 1960.

Also a series of notes on the *Geneva Convention* for offshore boundaries in the Professional Geographer, 1958-1960.

APPENDIX E

Comments on and Excerpts from the Transcript and Record of Hearings held in Morgan City, Louisiana, on August 3, 1967 and in New Orleans, Louisiana on August 7, 1967, regarding a proposal to use Shore Configurations in Demarking Louisiana's Inland Waters

The following materials show the practical necessity of not only keeping the Inland Water Line at its present location, but also the need for U. S. jurisdiction over those waters behind the line. The federal government, apparently to avoid inconsistencies with its position in this litigation, has, at page 48 of its January, 1968 Memorandum, attempted to explain away the international law complications and navigational and economic harm its position will cause the United States by contending that it is a matter of "voluntary cooperation" for foreign vessels to respect the assertion of regulatory jurisdiction shoreward of the Inland Water Line, thus suggesting that two sets of rules may be in force in the same waters, a proposition clearly contrary to common sense safety needs and Congressional intent. As to some of the waters it attempts to explain the complication away by implying that the full sovereignty regulation is explained by the power of the nation to regulate navigation in the territorial sea, which the Justice Department recognizes. The government totally ignores the fact that the Safety of Life at Sea Conventions and the related agreements

which formed the international law concensus embodied in the International Rules of the Road, expressly provide for exception from the applicability of the international rules only as to inland waters. International Rules, Article 30. That is, the Geneva Convention (which provides in Article 25 that said Convention will not interfere with other Conventions or agreements among nations) would not, as the United States contends, legalize application of inland rules in the territorial sea, irrespective of the fact that there is a merely general power to regulate navigation.

If the United States position in this litigation is adopted, in addition to causing great embarassment to the Untied States in its international relations, the legality of the inland rules for the waters behind the present line would be seriously cast in doubt. The result of this, as shown by facts presented below, would be chaos for the fishing, shrimping, marine transportation, and numerous other economic interests of the nation which need to have these waters classified as inland waters to be assured of the applicability of various inland navigational rules, and other regulatory laws applicable only to inland waters. These same facts show the necessity, economic and otherwise, of recognizing the waters involved to protect vital coastal interests.

The attorney for Louisiana's Fish and Wildlife Commission made the following remarks at New Orleans, pointing to the economic and safety disadvantages of having inland waters tied to shore configurations:

The subject that I want to emphasize here is the fact that safety of navigation, which is certainly a legitimate concern of the Coast Guard, is not merely related in connection with the Rules of the Road to problems of certainty of identification of the, as the Coast Guard styles it, the line of demarcation of the line dividing the high seas from inland waters. If you look at the line on the present map, it becomes quite easy to understand that the probability of vessels having passing situations, meeting situations, potential collision hazards, is far less at the present location than it would be at the numerous passes and channels entering the physical shore. I can mention some of these channels in brief. The channel going to New Orleans, the shipping channel there, the various passes of the Mississippi River, the passes within the Delta, the Empire Canal, the Barataria Pass, the Caminada Pass, the various channels between the Timbalier Islands and the channels in the Cailiou Bay area, the ship channels leading to Morgan City and the Atchafalaya River System, which is so vital to the economy of that area and the off-shore oil industry, the channel leading into Lake Charles, the channel at the Sabine, all of these and many others which are too small but yet vitally important in the aggregate, comprise a very extensive maze of channels. I am going to tell you now of a little fishing trip Friday night and the comments of a simple boat operator because I think the comments of that fellow who earns his livelihood in these waterways by taking people fishing, and I think he works as a full-time boat operator, a full-time boat operator for an oil company, are typical of the problems that will be

encountered with the 6,000 plus commercial fisheries operators, the 17,000 plus pleasure boat operators who have boats south of Highway 190 and who operate in the coastal area, these thousands upon thousands of people are accustomed to the Inland Rules of the Road. These thousands upon thousands of people in exiting the main land or entering it are accustomed to the passing, the meeting signals, et cetera, of the Inland Rules. These good people, many of them are French-speaking people who have not had the opportunity of extensive education in the English language and who would have great difficulty in becoming educated to many of these things which one might think are very petty differences in the Rules, but which in the potential collision situation may be immensely hazardous.

Going back to this typical boat driver, fisherman guide, as we were coming out of a pass into a channel, I was asking him about the signals and he was informed about the Inland Rules and passing signals. I asked him what would he do if they did away with the signals in these channels for meeting and passing, and he said "Well, they would have to make some more because you can't get by without these signals in these channels, you are going to run aground if you don't have them," and you don't have the meeting and passing signals in the International Rules. They are designed for constricted waters, perhaps individually petty, but cumulatively massive.

As far as the fog signals, the danger signals, the differences between Article 18 of the Inland Rules and 25(b) of the International Rules, the rules on the signals for backing appear to be

different. There are some differencies between distress signals. I think Rule 32, Orders to Helmsmen, provisions of International Rules are not contained. There are differences in anchor, there are differences in the lights to be displayed by shrimp fishermen, and here I want to emphasize that shrimp fishing is an activity in which large and small vessels have occasion to engage at night. There will be literally thousands of shrimp vessels if this proposal goes through which are not equipped with green lights and you, of course, have differences for lights as far as placement and height of mast and differences between lights which cumulatively will form a tremendous problem of attempting to obtain compliance by any vessels, large or small. It would be impossible to expect any rapid transitions as far as the new rules by these men, and we submit you cannot expect, unless the most urgent of reasons were present, these tens of thousands of boat operators, pleasure and commercial fishermen, to study and overnight become familiar with the International Rules and the differences between them which can make a vital difference in the channels.

The three thousand acres of privately leased oyster fisheries at places like Sandy Point Bay, south of Marsh Island in the Shell Keys vicinity, in the vicinity of—well, in the East Bay proper, and at various other locations, and in addition, there are six thousand acres of applications for leases pending outside of the proposed line as we understand it to be demarked.

In this connection, I see this map differs in its interpretation of the possible effect from yet another map which I saw of the same scale at the

Coast Guard Headquarters in New Orleans, and both of these maps differ in some detail. This is an example of the difficulties of attempting to have a line tied to shore or shore objects in any shape or form and shows the wisdom of a line designated and defined by buoys and other markers in the waters.

As to any contention that the line is more easily spotted, when it is related to the shore objects, I think as we passed out there in a light squall, you couldn't see when you were coming out, but one thing you could see were the oil platforms out in the open water with their flares and their lights, things that are well plotted upon many maps in which fishermen and others can get bearings and relationships from the hundreds upon hundreds of oil platforms.

Indeed, as I recall, one federal authority mentioned in excess of 2,000 platforms and structures along our coastal area. In this connection, we submit the present line is relatively easier to locate, indeed more easy to locate with reference to structures in the water at many locations.

I wish to also emphasize that in light of the language of the Supreme Court in the Delaware case, remarking it was the intent of Congress to call for the same rules to be applied in the channels leading to the harbors, in light of this language and in light of the unanimous position on the stand of pilots organizations from Corpus Christi, Texas to Mobile, Alabama, protesting the proposed efforts to have the rules changed in the midst of these various channels, that it seems an almost navigational hazard indeed rather than

a change to benefit navigation, to change these channels, and from a fisherman's point of view, no mid ground would be visible either. You would have the matter of fishermen having to cross the channels and the only practical solution therefore is the solution recognized by the Coast Guard Commandant in 1953 when he elected to employ the outer buoys of the various channels and to draw a line between these in the manner prescribed in the general regulations of the Coast Guard.

We respectfully submit, therefore, that the dangers to fisheries and related navigation suggested by the proposed change are immensely greater than any possible rectification of alleged inconvenience in locating the line at present. We know of no collision having occurred because of problems connected to the present line, but the hazards in the proposed new line would be inviting collision, and for that, among many other reasons, we urge rejection of the proposal.

The American Waterways Operators representative opposed the shoreward change, with the following:

Statement on behalf of THE AMERICAN WATERWAYS OPERATORS, INC, at the Public Hearing conducted by the Commander, Eighth Coast Guard District, Room 609, Federal Office Building, New Orleans, Louisiana, Monday, August 7, 1967.

* * *

My name is McVey F. Ward. I am the Southern Regional Representative of The American Waterways Operators, Inc., a nationwide mem-

bership trade association representing the towboat, tugboat, bargeline industry. Executive offices of our Association are located at 1250 Connecticut Avenue, Washington, D.C. Field offices are maintained in New York City and New Orleans, Louisiana. I have been designated as the spokesman for our Association at this Public Hearing.

Membership of The American Waterways Operators, Inc. is comprised of over 200 individual companies, the majority of whom own and operate towboats, tugboats and barges, shallow-draft self-propelled tankers and freighting vessels, dredges, and marine construction and salvage equipment on our nation's commercially navigable waterways, and in the coastwise, intercoastal and contiguous trades. Other members operate shipyards, terminals and service companies.

Many members of our Association operate vessels in the Gulf of Mexico. They have expressed their serious concern to us over the proposed shoreward relocation of the line of demarcation separating the areas of application of the International and Inland Rules of the Road in the Gulf from Cape St. George, Florida to the Mexican Border.

On their behalf we interpose the objection of The American Waterways Operators, Inc. to the proposed changes and set forth the following reasons for our objections.

The present line of demarcation is definable. Its location is well known to navigation interests operating in the affected areas and the line is

clearly marked on all appropriate navigation charts. The demarcation line has been established, essentially in its present position, since at least February 1, 1948.

The location of the line was then established in Regulations promulgated by the Commandant of the Coast Guard as a result of Public Hearings conducted by the Merchant Marine Council in September, 1947. As specified by the Coast Guard at that time the "General basis and purpose" of establishing the boundary line was to divide "the high seas from rivers, harbors and inland waters *in accordance with the intent of the statute* and to obtain its correct and uniform administration". (Emphasis added.)

At this time under the stated "General rules for inland waters" the demarcation line was established "approximately parallel with the general trend of the shore, *drawn through the outermost buoy* or other aid to navigation of any system of aids. (Emphasis added.)

Aside from some relatively minor editorial changes and corrections, the line as established in February, 1948 remained in effect, according to our records, until January 1, 1954. Some changes in the location of the line were made as of that date, at least partially as a result of a Public Hearing conducted by the Commander of the Eighth Coast Guard District on June 2, 1953 in New Orleans.

However, in the 1954 Regulation also, the general basis and purpose of the boundary line was again stated to be "in accordance with the intent of the statute." The identical language

previously quoted relative to establishing the line of demarcation approximately parallel to the shore drawn through the outermost buoy is used to justify the proposed changes and support the relocation of the line. The present line of demarcation, according to our records, stems from this January 1, 1954 effective date.

In the period of time since then, the location of the line has become well known, and recognized and observed by our members and others operating in the Gulf by custom and through usage. Thus, we feel the line has well served the stated purpose for which it was established, and we can see no reason for the present proposal to shift the line farther inshore.

Since the boundary line relocation proposal, as detailed in the Proposed Rulemaking issued by the Commandant on June 20, 1967, does not contain any specific provision for changing or amending either Sections 82.1 or 82.2 (which contain the "General basis and purpose" and "General rules for inland waters" provisions) we can only conclude that this present relocation proposal is also considered to be "in accordance with the intent of the statute". However, since Section 82.2 still contains the "approximately parallel with the general trend of the shore" and "outermost buoy or other aid" stipulations, it appears to us that the entire Proposed Rulemaking is in direct conflict with this Section.

One significant result of this proposed shoreward shifting of the lines would be to bring the provisions of at least three laws affecting marine safety, which are administered by the Coast

Guard, to bear throughout a large geographical area of the Gulf where they are not presently applicable. The three laws we refer to are, The Officers Competency Act, the Coastwise Load-line Act, and the law requiring inspection of sea-going motor propelled vessels of 300 gross tons and over. If this is not an objective of the proposal, it is undeniably one of the results.

We consider this to be a severe and drastic change, particularly since any of our AWO members presently operating in the Gulf are doing so only in those areas where the Inland Rules are applicable. Their operations are purposely confined to these waters. They have neither the desire nor the intent to operate on the high seas under the provisions of the International Rules and the related laws administered thereunder.

It seems to us to be unfair in the extreme for an Agency of Government to attempt to alter the existing status quo solely by administrative action, thus changing the conditions under which our members are presently operating, and subjecting them to the burden of additional regulation and inspection when they are not presently so encumbered.

For the foregoing reasons, and on behalf of our members, we respectfully request that this Proposed Rulemaking be withdrawn by the Commandant.

Lake Charles Pilots, through Captain McFatter, stated:

We wish to express our opposition to the proposed change in the boundary line between Inland

> and International Waters. We feel that the present boundary is more conducive to safe navigation than the proposed change.

Oyster fisherman, in great numbers, opposed the dangers of being subjected to international regulations. Typical of the comments of the many humble oyster fisherman (who were concerned obout their leases being subjected to International Rules navigation regulation *and* Inland regulation in the delta) were the remarks of a Mr. M. J. Pacau: "Don't change it. This will mean that oyster fisherman have to know two sets of rules." Mr. Kyle, a member of the Louisiana Wild Life and Fisheries Commission, testified at the Morgan City hearing, transcript p. 29:

> "With this thing, we feel very, very strongly that the rule change will tend to threaten the economic life of all the small shrimpers, most of our oyster leases, some of our shell dredging and a good bit of the small crew boat business. Therefore, the Commission strongly opposes any changes in the rules at all." (Referring to rules changes high seas classifications would cause.)

Fishing interests from the entire Gulf Coast region were opposed to the change, which would have caused many thousands of vessels—the great bulk of the Gulf fleets—to be subjected to inland *and* international regulation, and greatly aggravated the problem of changing signals or equipment displayed. A memorandum dated August 21 was filed in the record of the New Orleans hearings by a five state organiza-

tion representing the fisheries agencies and interests along the entire Gulf Coast:

MEMORANDUM

of

the Gulf States Marine Fisheries Commission in Opposition to the Proposed Change in the Inland Water Boundary.

This is to voice opposition to the proposed change in the Inland Water Boundary Line.

We are particularly concerned about the adverse effect this proposed line would have upon the Gulf Coast fishing industries, especially the shrimping industry. Although we understand that the Coast Guard may be considering this change because of the difficulty of some shrimping vessels in ascertaining at what point they had crossed the present line so that they might comply with required lights, we feel that the gravity of such a problem would be in no way alleviated by the proposed change, but rather would be aggravated by it.

The facts upon which we have based our conclusion are set forth at length in the statement of J. Y. Christmas, a noted marine biologist, which is attached hereto. From Mr. Christmas's figures, it appears that many boats which at present operate under only one set of rules would be operating under two sets if the change took effect. The importance to the fishing industry of the area at present landward of the inland water boundary line is illustrated by the figures available on the number of trips made in Gulf Waters. In the area between Mobile Bay

and Galveston Bay 69.1% of all trips were made in 5 fathoms of water or less, which appears to be well within the present line. Additionally, 18.2% were completed in 10 fathoms of water or less, most of which would be entirely within the present line. In some areas along the coast close to 100% of the trips are made within the present line.

There are approximately 9,500 American commercial fishing vessels operating in the Gulf of Mexico, in addition to innumberable pleasure fishing vessels. The great bulk of these vessels fish within the present inland water boundary line. No precise figures are available on the number of fishing vessels which cross the present line, but based upon the size and type of equipment of the commercial vessels, we estimate that no more than 2,000 of these have the capability of fishing in the vicinity of the present line. How many have occassion to do so is unknown. But it is certain that moving the line landward would effect many more vessels than are presently affected by the necessary change in lights while crossing the line.

We agree that it is absurd to require fishing vessels engaged in trawling near the line to change their lights each time they cross it. But we fail to see how moving the line landward will solve this problem. Doing so would merely mean that many more boats would be required to make such changes than they have to at present, since many of the smaller vessels would find themselves crossing back and forth between Inland and International Rules Waters where they had never done so before. They would be required to

make changes in lights on the basis of criteria about as certain as a roll of honest dice—the general configuration of the coastline. When they made a wrong guess as to when they were landward of the proposed line after crossing from outside the line, they would be subject to a fine. If they became involved in a collision while carrying the wrong lights, they would be subject to civil liability.

For these reasons we feel that the proposed change in the Inland Water Boundary Line is unwise and that the correct solution to the problem of changing trawling lights while crossing the line is to change the Inland Rules' lighting requirements so as to conform with those of the International Rules, at least with respect to trawling. If this is done, there should be a period of several years during which either set of lights would be permissible on inland waters so not to impose a serious burden of compliance on the owners of small fishing vessels. A change bringing into harmony the lighting requirements of the two sets of rules, unlike a change in the Inland Water Boundary Line, would greatly promote the cause of maritime safety and hence the interests of the fishing industry.

Such is our present position, concurred in by the directors of the conservation commissions of the affected five states. We will have an open discussion of the issue at our annual meeting in Montgomery, Alabama, October 19th and 20th, to which the Coast Guard will be cordially invited to send representatives. At the meeting a formal resolution will be adopted.

At the request of the Alabama Department of Conservation, we are enclosing a letter from them opposing the change. Also enclosed, in addition to the report by Mr. Christmas are copies of a resolution on the issue reported favorably by both House and Senate Committees of the Alabama Legislature and the federal statute creating the Gulf States Marine Fisheries Compact.

We should also like to point out that it is our understanding, based upon personal telephone conservations, that, as of today, August 21, the author of the request to change the Inland Water Boundary Line concurs in the present position of this commission.

We hope that the views we have expressed will receive your sympathetic consideration.

Respectfully submitted,

GULF STATES MARINE
FISHERIES COMMISSION
By /s/ JOS. V. COLSON, Director

The statement of J. Y. Christmas, the noted marine biologist reads:

Distribution of Fishing Effort in Waters outside the Coast Line of the Northern Gulf of Mexico with special reference to Shrimp.

INTRODUCTION

The Department of Transportation has announced proposed (Federal Register, Vol. 32, No. 118—Tuesday, June 20, 1967) changes in boundarylines of inland waters in the Gulf of Mexico. The announcement of hearings (*op. cit.*) noted the problems fishing vessels may have in locating the boundary line as it now stands but failed to consider the large number of fishing trips made by fishing boats in near shore waters without crossing the inland waters boundary. While it may be "arbitrary to require a vessel engaged in fishing to change lights in the middle of a fishing operation taking place anywhere from 10 to 20 miles offshore" it may be even more arbitrary to require vessels that have traditionally fished shallow, near shore waters without crossing the line of demarcation to comply with International Rules of the Road.

This report is concerned with fishing effort in the Northern Gulf as reported in Bureau of Commercial Fisheries statistical reports.

Major Fisheries

Menhaden, shrimp, oysters, crabs and industrial bottom fish, used to produce pet food and fish meal, account for most of the fishing in the "Fertile Fisheries Crescent" of the Northern Gulf. All are estuarine dependent.

Menhaden fishing is carried out by large vessels using purse seines. These vessels travel only very short distances after a fishing operation is started. It seems unlikely that the proposed changes would have any appreciable effect on their operation.

Crab and oyster fishermen operate almost entirely in relatively protected estuarine waters and seldom go beyond the shore lines as described in the proposed changes.

The trawl fishery for industrial bottom fish was reviewed by Roithmeyer (1965). The industrial bottom fish fleet during the study period (1959-63) consisted of a resident fleet of approximately 50 vessels and additional transient vessels during slack periods during the shrimp fishery. Most of these are about fifty feet long and have a fish capacity of thirty tons. Several larger vessels ranging from sixty to ninety-four feet in length with fish capacities up to 125 tons are included. All vessels were equipped with echo-sounders, radio-telephones and power-driven winches. Resident trawlers averaged 3½ trips per month. Evidently, trawlers for industrial bottom fish complete approximately 2100 trips per year.

The fishing grounds extend from Perdido Bay, Florida to Point Au Fer, Louisiana, and extend seaward from shore to about 30 fathoms, varying in width from about three to fifty miles. Forty-seven percent of the fishing effort during the study period was expended in near shore (less than seven fathoms) waters. Evidently most of this fishing was done under inland Rules, but

vessels in the relatively small industrial fishes fleet may cross the line of demarcation while fishing but should be able to plot a reasonably accurate position based on knowledge of water depth.

The shrimp fishing, producing the most valuable commercial catch from the Gulf of Mexico, is carried on by a large number of boats and vessels of great variety. These boats and vessels completed 252,614 trips in the Gulf of Mexico during 1965, the last year of published summary data (C.F.S. No. 4111, Gulf Coast Shrimp Data—1965). In 1964 (Lyles, 1966) 237,021 trips were reported.

Lyles (1966) reported 3,582 motor vessels (over five tons net capacity) with a total tonnage of 151,665 and 10,149 motor boats (less than five tons net) operating in Gulf waters in 1964. The number of shrimp trawls operating in that year was 9,178. Louisiana had the most fishing boats and vessels (4,289 and 1,602 respectively) and the most shrimp trawls (5,286) in operation. Clearly, the largest number of trips is made by boats engaged in the shrimp fishery.

Shrimp Life History

The life history of shrimp determines the location and intensity of fishing. Christmas (1965) gave the following brief description:

"Commercial penaeids in the Gulf spawn in the open sea. The eggs produce planktonic nauplii. As metamorphosis proceeds through numerous ecdyses to early postlarval stages the young shrimp move toward estuarine areas where they

drop out of the plankton. In reduced salinities at temperatures above 20° C (Saint Amant et al., 1963) 'Metamorphosis of postlarve into rapidly growing juveniles occurs suddenly!' Within a few months, as they approach maturity, young adults move back to the more constant environment of the open sea to complete the life cycle."

As soon as young shrimp reach commercial size, the harvest begins in inshore waters and follows the maturing crop out to sea.

Fishing Effort

In 1956 the Bureau of Commercial Fisheries started collecting Gulf Coast Shrimp Data showing catch by depth, area of capture, species, size, number of trips and number of days fished. Figure 1, taken from one of these reports shows the statistical areas used for these reports.

Table 1 shows the number of trips completed in waters outside the shore line as described in the proposed changes in the Rules of the Road demarcation line during the last five years, between Mobile Bay and Galveston Bay. In this area 69.1 percent of all trips were made in waters of five fathoms or less and an additional 18.2 percent were completed in ten fathoms or less. An average of 35,904.4 trips were completed in the 00-05 fathom zone which is, for the greater part, inside the present line of demarcation. As shown in Table 2 there is even greater concentration of effort in these waters between the Mississippi River and Texas where 44,601.3 trips were made in five fathoms or less in 1966.

Many of the boats fishing this area begin

fishing in estuarine areas and follow the young shrimp beyond the coast line but do not venture very far off shore. Consequently they do not, under present rules, enter waters covered by International rules and are not equipped to do so. Implementation of the proposed changes in lines of demarcation may cause far greater problems and hardship than are evidently resulting from the present position of the line.

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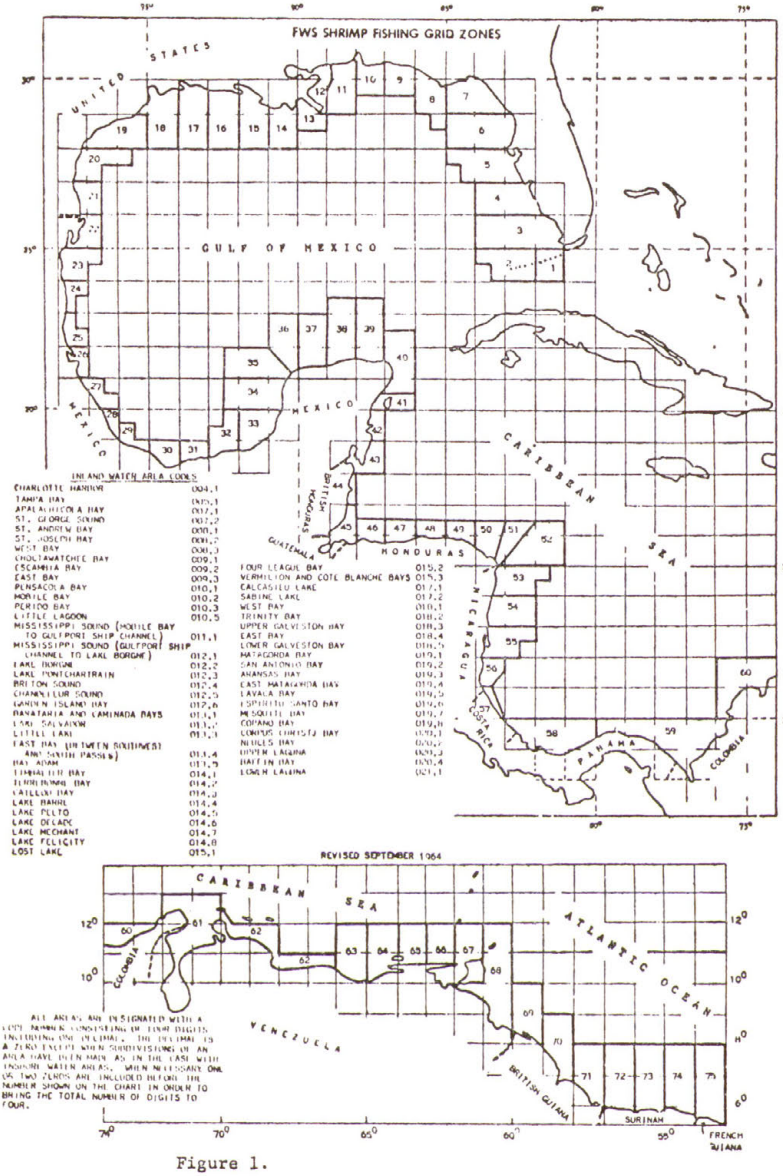
FWS SHRIMP FISHING GRID ZONES
UNITED STATES
GULF OF MEXICO
MEXICO
CARIBBEAN SEA
HONDURAS
GUATEMALA
BRITISH HONDURAS
NICARAGUA
COSTA RICA
PANAMA
COLOMBIA
VENEZUELA
ATLANTIC OCEAN
BRITISH GUIANA
SURINAM
FRENCH GUIANA
REVISED SEPTEMBER 1964
INLAND WATER AREA CODES
CHARLOTTE HARBOR 004,1
TAMPA BAY 005,1
APALACHICOLA BAY 007,1
ST. GEORGE SOUND 007,2
ST. ANDREW BAY 009,1
ST. JOSEPH BAY 009,2
WEST BAY 008,3
CHOCTAWATCHEE BAY 009,1
ESCAMBIA BAY 009,2
EAST BAY 009,3
PENSACOLA BAY 010,1
MOBILE BAY 010,2
PERDIDO BAY 010,3
LITTLE LAGOON 010,5
MISSISSIPPI SOUND (MOBILE BAY TO GULFPORT SHIP CHANNEL) 011,1
MISSISSIPPI SOUND (GULFPORT SHIP CHANNEL TO LAKE BORGNE) 012,1
LAKE BORGNE 012,2
LAKE PONTCHARTRAIN 012,3
BRITON SOUND 012,4
CHANDELEUR SOUND 012,5
GANDEN ISLAND BAY 012,6
BARATARIA AND CAMINADA BAYS 013,1
LAKE SALVADOR 013,2
LITTLE LAKE 013,3
EAST BAY (BETWEEN BOOTHVEE AND SOUTH PASSES) 013,4
BAY ADAM 013,5
TIMBALIER BAY 014,1
TERREBONNE BAY 014,2
CATELOU BAY 014,3
LAKE MAUREL 014,4
LAKE PELTO 014,5
LAKE DECADE 014,6
LAKE MECHANT 014,7
LAKE FELICITY 014,8
LOST LAKE 015,1
FOUR LEAGUE BAY 015,2
VERMILION AND COTE BLANCHE BAYS 015,3
CALCASIEU LAKE 017,1
SABINE LAKE 017,2
WEST BAY 018,1
TRINITY BAY 018,2
UPPER GALVESTON BAY 018,3
EAST BAY 018,4
LOWER GALVESTON BAY 018,5
MATAGORDA BAY 019,1
SAN ANTONIO BAY 019,2
ARANSAS BAY 019,3
EAST MATAGORDA BAY 019,4
LAVACA BAY 019,5
ESPIRITU SANTO BAY 019,6
MESQUITE BAY 019,7
COPANO BAY 019,8
CORPUS CHRISTI BAY 020,1
NUECES BAY 020,2
UPPER LAGUNA 020,3
BAFFIN BAY 020,4
LOWER LAGUNA 021,1
ALL AREAS ARE DESIGNATED WITH A CODE NUMBER CONSISTING OF FOUR DIGITS INCLUDING ONE DECIMAL. THE DECIMAL IS A ZERO EXCEPT WHEN SUBDIVISIONS OF AN AREA HAVE BEEN MADE AS IN THE CASE WITH INSHORE WATER AREAS. WHEN NECESSARY ONE OR TWO ZEROS ARE INCLUDED BEFORE THE NUMBER SHOWN ON THE CHART IN ORDER TO BRING THE TOTAL NUMBER OF DIGITS TO FOUR.

Figure 1.

Trips made to shrimp boats (1962-1966) in waters outside the shore line between Mobile Bay and the Galveston Bay area shown by statiscal area and depth.

00-05 Fathoms

Area	011.0	013.0	013.4	014.0	015.0	016.0	017.0	018.0	Totals	% of Total
1966	326.1	16053.9	9261.3	1380.6	4609.9	2326.3	10969.3	1819.9	46747.3	75.2
1965	436.0	11743.0	4731.5	1129.3	5949.2	2001.7	7202.2	2126.0	35318.9	68.0
1964	430.0	13925.5	6302.4	1590.8	5246.4	1552.9	7561.7	1808.5	38418.2	69.2
1963	627.8	5217.5	1162.3	1116.1	5565.1	1057.4	4620.4	1109.2	20475.8	48.1
1962	1263.5	8069.0	5221.0	2368.7	6667.3	845.7	12722.3	1404.4	38561.9	81.2
Totals	3083.4	55008.9	26678.5	7585.5	28037.9	7784.0	43075.9	8268.0	179522.1	69.1
Mean	616.7	11001.8	5335.7	1517.1	5607.6	1556.8	8615.2	1653.6	35904.4	69.1

06-10 Fathoms

Area										
1966	1539.6	538.7	46.4	234.1	681.0	677.6	1780.0	1799.0	7296.9	11.7
1965	1511.6	686.6	3.0	699.7	569.0	491.8	5028.9	631.4	9622.0	18.5
1964	1501.8	2833.7	90.3	771.3	924.3	717.8	2934.0	1190.2	10963.4	19.7
1963	3122.4	8792.1	534.0	198.6	481.8	452.7	869.4	1328.8	15779.8	37.1
1962	1206.2	270.9	1.0	114.8	274.9	442.7	489.6	966.2	3766.3	0.8
Totals	8881.6	13122.0	674.7	2018.5	2931.0	2782.6	11102.41	5915.6	47428.4	18.2
Mean	1776.3	2624.4	134.9	403.7	586.2	556.5	2220.5	1183.1	9485.7	18.2

TOTALS

Area										
1966	4708.4	17824.5	9307.7	3043.2	6131.2	3365.9	13058.3	4692.6	62131.8	100.0
1965	4197.2	13181.3	4735.5	2804.7	7294.0	3248.6	12019.0	4410.7	51891.0	100.0
1964	3928.0	17494.1	6392.7	2902.3	7051.7	2700.7	10681.1	4344.4	55495.0	100.0
1963	4970.1	14896.2	1726.3	2275.3	7024.9	2019.8	5664.4	3933.2	42510.2	100.0
1962	3463.1	9725.2	5222.0	3346.1	7328.3	1392.6	13248.4	3763.7	47489.4	100.0
Totals	21266.8	73121.3	27384.2	14371.6	34830.1	12727.6	54671.2	21144.6	259517.4	100.0
Mean	4253.4	14624.3	5476.8	2874.3	6966.0	2545.5	10934.2	4228.9	51903.5	100.0

TABLE 2

Trips made by shrimp boats in 1966, Mississippi River to Texas, in waters outside the shore line, shown by months, statistical area and depths.*

00-05 Fantoms

Area	013.0	013.4	014.0	015.0	016.0	017.0	Totals
January	2134.8	1019.6	60.6	361.9	193.0	301.0	4070.9
February	230.0	.....	.....	49.6	76.0	688.0	1043.6
March	20.0	3.0	.....	84.6	97.0	599.0	803.6
April	2.0	.....	1.0	100.7	156.2	68.1	328.0
May	768.0	339.0	4.9	408.3	258.3	878.4	2656.9
June	2228.5	936.0	9.9	357.3	311.2	1199.7	5042.6
July	721.0	420.0	117.3	106.8	272.9	1160.5	2798.5
August	1682.0	.....	216.5	427.6	235.0	1194.9	3756.0
September	2033.1	1800.0	184.0	390.6	291.6	1443.1	6142.4
October	460.9	2002.6	347.0	904.3	176.6	1248.5	5139.9
November	3355.3	1800.1	236.7	726.0	104.1	1265.1	7487.3
December	2418.3	941.0	202.7	692.2	154.4	923.0	5331.6
TOTALS	16053.9	9261.3	1380.6	4609.9	2326.3	10969.3	44601.3

06-10 Fathoms

January	21.5	.....	17.2	10.6	10.1	16.0	75.4
February	143.9	2.6	12.4	42.0	39.8	22.0	262.7
March	10.2	23.0	2.5	18.0	25.0	63.8	142.5
April	12.0	2.2	1.0	34.8	53.8	589.7	693.5
May	9.7	.....	28.2	37.2	77.2	659.7	812.0
June	19.8	.....	95.7	93.5	150.1	148.9	498.0
July	5.0	.....	7.5	87.9	104.5	66.3	271.2

August	3.0	.....	9.0	90.3	44.3	53.0	199.6
September	.....	.....	1.0	30.9	67.8	22.5	122.2
October	114.1	10.4	5.6	103.2	9.4	15.0	257.7
November	109.8	4.4	50.6	14.5	68.1	97.2	344.6
December	89.7	3.8	13.4	118.1	27.5	26.4	278.9
TOTALS	538.7	46.4	234.1	681.0	677.6	1780.5	3958.3
January	2194.9	1019.6	113.6	379.0	222.8	328.0	4257.9
February	489.6	2.6	40.1	125.7	132.3	716.0	1506.3
March	125.2	26.0	77.3	156.1	135.7	670.8	1191.1
April	127.2	2.2	118.4	242.6	262.8	719.4	1472.6
May	831.1	339.0	181.8	514.1	422.3	1581.9	3870.2
June	2321.7	936.0	218.4	475.6	503.9	1401.8	5857.4
July	818.4	420.0	451.1	312.5	411.2	1258.8	3672.0
August	1849.0	.....	505.7	731.5	298.1	1275.4	4659.7
September	2223.2	1800.0	333.6	559.6	417.4	1519.1	6852.9
October	684.3	2013.0	433.5	1027.7	195.3	1264.5	5618.3
November	3589.5	1804.5	339.0	765.3	179.1	1369.1	8037.5
December	2570.4	944.8	270.8	850.5	185.0	953.5	5775.0
TOTALS	17824.5	9307.7	3083.3	6131.2	3365.9	13058.3	52770.9

*These data have been compiled from Gulf Coast Shrimp Data as published by the United States Department of the Interior, Fish and Wildlife Service, Bureau of Commercial Fisheries, Washington, D. C.

The Louisiana Shrimp Association, in a letter dated August 1, 1967, filed in the Morgan City record stated:

> Our Association represents over 3,000 shrimp fishermen who operate principally in the state's offshore lakes, bays and sounds, inside the existing coast line or outer boundary of the state's inland waters, where the inland rules and pilot rules of navigation apply.
>
> We know as a matter of fact that all of our experienced fishermen are familiar with that coast line as shown on charts put out by the federal government.
>
> If the line dividing the offshore lakes and bays, or inland waters was changed and the Gulf was brought up to the shore line as proposed, it would put our fishermen to a lot of hardship because they are not familiar with international rules and their boats are not equipped to comply with the international rules; and if the coast line is changed and the international rules are made to apply way up to the shore line or headland to headland and islands close to shore, then practically all of them would be in a position of violating the international rules.
>
> Such a change would cause confusion. Our shrimp fishermen would be at a great disadvantage and they would derive no benefit from such a change. These inland rules have been in effect for many, many years and all of our fishermen are familiar with them and their boats are equipped to comply with inland rules.

The Louisiana Shrimp Association goes on

record officially as opposing any change as proposed in the boundary lines of inland waters or in the "Proposed Rule Making" according to the Coast Guard notice dated June 20, 1967.

Many other trade, transportation or industry groups opposed the change in various writings. None supported the change.

The statement of the Associated Branch Pilots of the Port of New Orleans is illustrative of the opposition voiced by the other pilots in the Gulf areas affected, including; the Gulfport Pilots Association, the Pascagoula Pilots Association, Lake Charles Pilots, and the Board of Pilots Commission for the Brownsville Navigation District of Cameron County, Texas:

> The members of the Associated Branch Pilots object to any change in the line of demarcation at Southwest or South Pass, and would like to have the line of demarcation run from Pass a Loutre sea buoy to the New Orleans light ship, and continue on to the Mississippi Gulf Outlet sea buoy.
>
> (1) The Supreme Court ruled in the Delaware case as follows:
>
> > We are of opinion, however, that the dredged entrance to a harbor is as much a part of the inland waters of the United States, within the meaning of this act, as the harbor within the entrance, and that the real point aimed at by congress was to allow the original code to remain in force so far as it applied to pilotage waters, or waters within which it is necessary for safe navigation, to have a

local pilot. It is important that a pilot, while conducting a vessel in or out of a harbor, should not traverse waters governed by two inconsistent codes of signals; and, if there are to be two codes, the line should be drawn between the high seas and the inland waters, wherein the services of a local pilot are requisite for safe navigation.

(2) The sea buoys being a point, where ships make their arrivals and take their departures, it is the most logical point for the line of demarcation. At South and Southwest Pass the channel is dredged, as far out as the bell buoys. At the Mississippi Gulf Outlet a group of oil and gas platforms are just off the entrance of the channel so for the safety of navigation inland rules should apply inside these buoys and light ship.

(3) At Southwest Pass the angle of swing from the jetties to the entrance ranges is forty-two degrees and visa versa. At South Pass the swing from the jetties to the ranges is thirty-two degrees and vice versa, which make these areas a most critical point to change whistle signals and lights from Inland Rules to International Rules and visa versa. The United States Engineers has the following rules and regulations for both South and Southwest Pass. (No vessel, except a towboat without tow, shall enter the channel between the jetties from the

sea until after any descending vessel which has approached within one mile of the outer end of the jetties shall have passed to sea.) At the sea buoys, which are one and seven tenths and one and nine tenths respectively from the most critical point the jetty ends is the logical place to change from Inland Rules to International Rules visa versa, where the ships are in deep water.

(4) We range from the sea buoys to board a ship coming up to the pass, as far as five miles to both eastward and westward of the sea buoys at times.

(5) There are more than five hundred deepsea ships entering and departing both South and Southwest Pass each month. The number of crew boats, oil supply boats, miscellaneous tows and trawl boats, that enter and depart each pass must be greater than fifteen hundred each pass a month, so with this volume of traffic, we feel the jetty ends are not the place to change the Rules of the Road from Inland to International or visa versa.

(6) Trawl boats when trawling in International waters must carry a green light over a white light, and when in Inland waters must carry a red light over a white light, which is similar to line fishing vessel in International waters.

We feel the deep sea vessels and the shallow draft vessels safety can best be served by leaving

> the line of demarcation remain, as it is between Southwest Pass, South Pass, Pass a Loutre and then continue to the light ship New Orleans and the sea buoy for the Mississippi River Gulf Outlet.

The opposition to the proposed change in the line of demarcation between inland waters and the high seas also came from various marine contractors, who included, for example: Brown and Root, Inc. (Engineers, Constructors), Louisiana Shell Producers Association, McDonough Marine Service, Ingram Contractors Inc. and many others. Typical of the opposition is the statement by Brown and Root, Inc.:

> Brown & Root, Inc. is an engineering and construction company whose home base is Houston, Texas with offices throughout the United States and the world. We have offices at Corpus Christi, Texas; Galveston, Texas; Morgan City, Louisiana; New Orleans, Louisiana; Venice, Louisiana; and near Mobile, Alabama, and from these coastal located offices we conduct a very large volume of marine engineering and construction work upon the Inland waters and the waters of the Gulf of Mexico from the coast of Florida to the lower tip of the coast of Texas, the area covered in subject Agenda. Our marine operations along the gulf coast began in the early 1920's and has progressed down through the years until the present date, at which time we have a very large fleet of marine construction equipment consisting of tugs, barges, pile driving barges, suction dredges, clamshell dredges, pipe trenching dredges, pipelay barges, derrick barges, salvage vessels, quarter boats and other nondescript vessels owned and operated by this com-

pany both on the Inland waters and on the offshore waters. The volume of work performed along the Gulf Coast by our company is quite extensive. I mention these things to let you know that our comments are based upon experience gained through many years of hard work, keen competition and attention to the hazards of the sea.

Our marine personnel are experienced seamen and navigators. Our Marine superintendents and marine managers have come up through the ranks. We have drawn upon this vast source of experience to formulate our protest to the proposed change in the line of demarkation of inland waters. We choose to submit our protest of the proposed changes to the Officer In Charge, Marine Inspection, for the entire district rather than submit individual protests to the Corpus Christi, Galveston, Morgan City and Mobile area offices.

We protest vigorously the proposal to move the inland water line. Our marine personnel have very little difficulty in locating the line as presently drawn. We cannot accept the idea that the present demarcation line is not easily located and is not serving its purpose of informing mariners about the rules of the road. Even though the line is located nearly twenty miles to the nearest land in some locations, and even though one leg of this line is drawn between two offshore aids to navigation that are over 120 miles apart, our marine personnel experience no difficulty in locating this line and being guided by its well-known location. If a vessel operator is unable to determine the

position of his vessel twenty miles from shore then that man has no business being an operator and the proposed new line could not and would not improve the operators navigation.

The international rules of the road and the inland rules of the road currently prescribe different lights for vessels. We propose that you change the inland rules to conform with the international rules. This seems to be the more logical solution. Even though you move this line into the shore line, mariners will still have the age-old problem of differences in the rules of the road when crossing the line wherever it may be. We cannot speak for fishing vessels in the Gulf of Mexico, but it seems to us that fishing vessels, like our construction vessels, are manned by competent seamen and navigators and certainly are capable of determining their position with reference to a definite and well established line of demarcation in the Gulf of Mexico. As to whistle signals and fog signals, we propose that the inland water signals be changed to agree with the international signals and then the problem would be completely eradicated. Such a change would eliminate the necessity of navigators of fishing vessels and construction vessels from having to commit to memory two sets of rules applicable to the same situation. We do not concur that the proposed change would make it more convenient by moving the line back to the shore line and from headland to headland. We are convinced that it would be just as difficult to locate the line drawn from headland to headland. We note with surprise that the U. S. Coast Guard puts forth the argument that it takes elaborate navigation to locate

a simple well-defined line drawn between two well-known and firmly established aids to navigation. It is hard to believe that any Coast Guard officer with his vast experience of seamanship and navigation, obtained on the high seas under all sorts of the very worst conditions, would now bring forth the thought that elaborate navigation is needed to determine the location of a simple line. We prefer to think that some one who has never been to sea wrote that argument.

The barge and towing interests were especially opposed to the proposed change because of the problems it would cause them. The objection by the Ingram Contractors Inc. is included here as an example of the statements of numerous operators, including; Ingram Corporation, Gulf Coast Transit Company, Mississippi Valley Association, Ingram Barge Co. and Central Marine Service Co.

In response to your request for comments on the referenced subject, we offer the following: Because there are far too many reasons that provoke our unalterable opposition to moving the present line of demarcation to comment on all of them here, we confine our comments to equipment only.

The present location of the demarcation line affords *us* a choice in the selection of equipment to be used on jobsite within presently designated inland waters. This selection is always made on the basis of location, exposure to the elements and easy accesibility of sheltered water. In making our choice, you may rest assured that we always

give first consideration to protection of life and property.

The law may be silent in many cases with regard to vessels used in a given situation but our self-imposed restrictions governing the selection of equipment may be even more stringent than legal restraints. The proposed relocation of the line of demarcation could remove our option to make a sound judgment of equipment utilization based on years of experience.

If the proposal to relocate this line were to become a reality, work previously performed shoreward of the line with non-load line vessels would henceforth require the use of vessels subject to the Coastwise Load Line Act of 1935. This would call for expensive alterations to previously acceptable non-load line equipment.

In addition to the consideration of our own equipment, Ingram must rely on the availability of inchartered auxiliary equipment. Included in the total supply of rental barges are some with load lines and others of the same size with no load lines. If this supply of barges was limited to those bearing load lines, that supply would be reduced to less than 25% of present. The immediate result would be a severe shortage of barges. The ultimate result, as barge owners incurred necessary expenses in complying with regulations to obtain load line certificates for the rest of their barges or in new construction would surely be an increase in barge rates.

There are many other reasons not touched on here, but for the reasons outlined, Ingram Contractors Inc. is totally opposed to any changes

in the present location of the line of demarcation. However Ingram Contractors Inc. is in complete accord with and is willing to support regulations that would bring about standardization or uniformity in matters of lighting, signals, and other navigation rules.

The Board of Commissioners of the Port of New Orleans, as well as the other major port commissions including those of the Lake Charles Harbor & Terminal District, St. Bernard Port, Harbor and Terminal District, Greater Port of Pascagoula, and the Morgan City Harbor & Terminal District opposed the proposed relocation of the line.

The following is the protest of the Board of Commissioners of the Port of New Orleans:

> The Board of Commissioners of the Port of New Orleans, an Agency of the State of Louisiana, originally created pursuant to Acts of the General Assembly of 1896, No. 70, with the power to regulate the commerce and traffic of the harbor of New Orleans in such manner as may, in its judgment, be best for its maintenance and development, hereby expresses its protest to the proposed rule-making, noted above, involving proposed changes in boundary lines of inland waters as they may affect the commerce and traffic of the Port of New Orleans, the second Port of the United States, in terms of cargo value.
>
> 1. The existing line of demarcation, dividing the highseas from inland waters, has been observed since 1948, with minor modifications which became effective on January 1, 1954.

2. The existing line of demarcation is well established, well obserced, and well understood as the line of demarcation between the applicable rules of the road.

3. The interest of the Port of New Orleans will be adversely affected by the proposed change because it will be cause for confusion, does not appear necessary or justified, will unnecessarily create hazards, confusion, and adversely affect the safety of vessels entering or leaving the Port of New Orleans.

Many fixed developments in the shallow coastal waters have taken place over the years. At the entrance channels to this Port, this is particularly true. Contrary to the statements made in Paragraph 5 of the proposed rule, the change is not a pratical proposal inasmuch as "moving the line so that it is crossed as a vessel enters any jetty or passes a headland . . ." would also increase confusion and safety hazards because of these extensive off-shore developments.

The record demonstrates that the present location of the line of demarcation has served satisfactorily and there does not appear any justification for a change in the existing line of demarcation along the coast of this State.

An increase in navigational hazards to cargo vessels serving this Port, and the deep water navigable areas of the lower Mississippi, will be detrimental to the progress and growth of the Port facilities which have been provided for the commerce and traffic of the United States.

It is also the opinion of this Board that the

change as proposed, will affect the safety of the many fixed petroleum, chemical and underwater mining installations located in these shallow coastal areas. These installations bring great benefits to the general economy of the United States.

After careful study of the proposed changes, the fixed offshore installations which have been established, and the navigational hazards which will be created by the proposed change and its probable economic and political effects compels this Board to register its opposition. This Board, therefore, protests such action and strongly urges that the proposal to change the boundary lines of inland waterways as published in the Federal Register, Volume 32, No. 118, June 29, 1967, be abandoned as unnesessary and be withdrawn.

At the hearings held at Morgan City on the 3rd of August, 1967, one of the attorneys representing the state of Louisiana asked Captain E. J. Worrel, the presiding officer at the hearings, if there had been any complaints or protest filed by any foreign nation over the present location of the line of demarkation as established by the duly authorized agencies of the federal government. The relevant portion of the testimony follows:

BY MR. SACHSE:

My name is Victor Sachse and I am one of the attorneys with the Attorney General for the State of Louisiana.

I understand from Commander Mar-

tin that we can only pose the question and that the answers will have to be supplied later. I have written it as briefly as I can, not to hold up your proceedings.

The State of Louisiana would like to know whether the Coast Guard keeps any written record of violations of its line; if so, where the record is maintained; and, if so, whether the record relates to any foreign vessels; and, if so, when and what foreign vessels and where; and what protests, if any, from any foreign nations have been made as to the 1953 Coast Guard line?

If we could have that information, it would, we think, be very helpful to a resolution to some of the problems that the notice raises.

BY MR. WORREL:

All right, sir. We certainly will. We will look at the proposal which you have submitted and we will give you an answer.

Thank you very much.

Since that time no such protest has been made known to the State of Louisiana because no such protest has ever been made.

There was not a single private citizen or organization which supported the proposed change at the Morgan City or New Orleans hearings. The Coast Guard dropped the proposal.

APPENDIX F

Submerged Lands Act 43 U.S.C.

Sub-chapter I. General Provisions

§ 1301. Definitions

When used in this chapter—

(a) The term "lands beneath navigable waters" means—

(1) all lands within the boundaries of each of the respective States which are covered by nontidal waters that were navigable under the laws of the United States at the time such State became a member of the Union, or acquired sovereignty over such lands and waters thereafter, up to the ordinary high water mark as heretofore or hereafter modified by accretion, erosion, and reliction;

(2) all lands permanently or periodically covered by tidal waters up to but not above the line of mean high tide and seaward to a line three geographical miles distant from the coast line of each such State and to the boundary line of each such State where in any case such boundary as it existed at the time such State became a member of the Union, or as heretofore approved by Congress, extends seaward (or into the Gulf of Mexico) beyond three geographical miles, and

(3) all filled in, made, or reclaimed lands which formerly were lands beneath navigable waters, as hereinabove defined;

(b) The term "boundaries" includes the seaward

boundaries of a State or its boundaries in the Gulf of Mexico or any of the Great Lakes as they existed at the time such State became a member of the Union, or as heretofore approved by the Congress, or as extended or confirmed pursuant to section 1312 of this title but in no event shall the term "boundaries" or the term "lands beneath navigable waters" be interpreted as extending from the coastline more than three geographical miles into the Atlantic Ocean or the Pacific Ocean, or more than three marine leagues into the Gulf of Mexico;

(c) The term "coast line" means 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;

(d) The terms "grantees" and "lessees" include (without limiting the generality thereof) all political subdivisions, muncipalities, public and private corporations, and other persons holding grants or leases from a State, or from its predecessor sovereign if legally validated, to lands beneath navigable waters if such grants or leases were issued in accordance with the constitution, statutes, and decisions of the courts of the State in which such lands are situated, or of its predecessor sovereign: *Provided, however,* That nothing herein shall be construed as conferring upon said grantees or lessees any greater rights or interests other than are described herein and in their respective grants from the State, or its predecessor sovereign;

(e) The term "natural resources" includes, without limiting the generality thereof, oil, gas, and all other minerals, and fish, shrimp, oysters, clams, crabs, lobsters, sponges, kelp, and other marine animal and plant life but does not include water power, or the use of water for the production of power;

(f) The term "lands beneath navigable waters" does not include the beds of streams in lands now or heretofore constituting a part of the public lands of the United States if such streams were not meandered in connection with the public survey of such lands under the laws of the United States and if the title to the beds of such streams was lawfully patented or conveyed by the United States or any State to any person;

(g) The term "State" means any State of the Union;

(h) The term "person" includes, in addition to a natural person, an association, a State, a political subdivision of a State, or a private, public, or municipal corporation. (May 22, 1953, ch. 65, title I, § 2, 67 Stat. 29.)

§ 1302. Resources seaward of the Continental Shelf

Nothing in this chapter shall be deemed to affect in any wise the rights of the United States to the natural resources of that portion of the subsoil and seabed of the Continental Shelf lying seaward and outside of the area of lands beneath navigable waters, as defined in section 1301 of this title, all of which natural resources appertain to the United States, and

the jurisdiction and control of which by the United States is confirmed. May 22, 1953, c. 65, Title II, § 9, 67 Stat. 32.

§ 1303. Amendment, modification, or repeal of other laws

Nothing in this chapter shall be deemed to amend, modify, or repeal the Acts of July 26, 1866 (14 Stat. 251), July 9, 1870 (16 Stat. 217), March 3, 1877 (19 Stat. 377), June 17, 1902 (32 Stat. 388), and December 22, 1944 (58 Stat. 887), and Acts amendatory thereof or supplementary thereto. May 22, 1953, c. 65, Title II, § 7, 67 Stat. 32.

Subchapter II. Lands Beneath Navigable Waters Within State Boundaries

§ 1311. Rights of the States—Confirmation and establishment of title and ownership of lands and resources; management, administration, leasing, development, and use.

(a) It is determined and declared to be in the public interest that (1) title to and ownership of the lands beneath navigable waters within the boundaries of the respective States, and the natural resources within such lands and waters, and (2) the right and power to manage, administer, lease, develop, and use the said lands and natural resources all in accordance with applicable State law be, and they are, subject to the provisions hereof, recognized, confirmed, established, and vested in and assigned to the respective States or the persons who were on June 5, 1950, entitled thereto under the law of the respective States

in which the land is located, and the respective grantees, lessees, or successors in interest thereof;

Release and relinquishment of title and claims of the United States; payment to States of moneys paid under leases

(b) (1) The United States releases and relinquishes unto said States and persons aforesaid, except as otherwise reserved herein, all right, title, and interest of the United States, if any it has, in and to all said lands, improvements, and natural resources; (2) the United States releases and relinquishes all claims of the United States, if any it has, for money or damages arising out of any operations of said States or persons pursuant to State authority upon or within said lands and navigable waters; and (3) the Secretary of the Interior or the Secretary of the Navy or the Treasurer of the United States shall pay to the respective States or their grantees issuing leases covering such lands or natural resources all moneys paid thereunder to the Secretary of the Interior or to the Secretary of the Navy or to the Treasurer of the United States and subject to the control of any of them or to the control of the United States on May 22, 1953, except that portion of such moneys which (1) is required to be returned to a lessee; or (2) is deductible as provided by stipulation or agreement between the United States and any of said States;

Leases in effect on June 5, 1950

(c) The rights, powers, and titles hereby recognized, confirmed, established and vested in and as-

signed to the respective States and their grantees are subject to each lease executed by a State, or its grantee, which was in force and effect on June 5, 1950, in accordance with its terms and provisions and the laws of the State issuing, or whose grantee issued, such lease, and such rights, powers and titles are further subject to the rights herein now granted to any person holding any such lease to continue to maintain the lease and to conduct operations thereunder, in accordance with its provisions, for the full term thereof, and any extensions, renewals or replacements authorized therein, or heretofore authorized by the laws of the State issuing, or whose grantee issued such lease: *Provided, however*, That, if oil or gas was not being produced from such lease on and before December 11, 1950, or if the primary term of such lease has expired since December 11, 1950, then for a term from May 22, 1953 equal to the term remaining unexpired on December 11, 1950, under the provisions of such lease or any extensions, renewals, or replacements authorized therein, or heretofore authorized by the laws of the State issuing, or whose grantee issued, such lease: *Provided, however*, That within ninety days from May 22, 1953 (i) the lessee shall pay to the State or its grantee issuing such lease all rents, royalties, and other sums payable between June 5, 1950, and May 22, 1953, under such lease and the laws of the State issuing or whose grantee issued such lease, except such rents, royalties, and other sums as have been paid to the State, its grantee, the Secretary of the Interior or the Secretary of the Navy or

the Treasurer of the United States and not refunded to the lessee; and (ii) the lessee shall file with the Secretary of the Interior or the Secretary of the Navy and with the State issuing or whose grantee issued such lease, instruments consenting to the payment by the Secretary of the Interior or the Secretary of the Navy or the Treasurer of the United States to the State or its grantee issuing the lease, of all rents, royalties, and other payments under the control of the Secretary of the Interior or the Secretary of the Navy or the Treasurer of the United States or the United States which have been paid, under the lease, except such rentals, royalties, and other payments as have also been paid by the lessee to the State or its grantee;

Authority and rights of the United States respecting navigation, flood control and production of power

(d) Nothing in this chaper shall affect the use, development, improvement, or control by or under the constitutional authority of the United States of said lands and waters for the purposes of navigation or flood control or the production of power, or be construed as the release or relinquishment of any rights of the United States arising under the constitutional authority of Congress to regulate or improve navigation, or to provide for flood control, or the production of power;

Ground and surface waters west of the 98th meridian

(e) Nothing in this chapter shall be construed

as affecting or intended to affect or in any way interfere with or modify the laws of the States which lie wholly or in part westward of the ninety-eighth meridian, relating to the ownership and control of ground and surface waters; and the control, appropriation, use, and distribution of such waters shall continue to be in accordance with the laws of such States. May 22, 1953, c. 65, Title II, § 3, 67 Stat. 30.

§ 1312. Seaward boundaries of States

The seaward boundary of each original coastal State is approved and confirmed as a line three geographical miles distant from its coast line or, in the case of the Great Lakes, to the international boundary. Any State admitted subsequent to the formation of the Union which has not already done so may extend its seaward boundaries to a line three geographical miles distant from its coast line, or to the international boundaries of the United States in the Great Lakes or any other body of water traversed by such boundaries. Any claim heretofore or hereafter asserted either by constitutional provision, statute, or otherwise, indicated the intent of a State so to extend its boundaries is approved and confirmed, without prejudice to its claim, if any it has, that its boundaries extend beyond that line. Nothing in this section is to be construed as questioning or in any manner prejudicing the existence of any State's seaward boundary beyond three geographical miles if it was so provided by its constitution or laws prior to or at the time such State became a member of the Union, or

if it has been heretofore approved by Congress. May 22, 1953, c. 65, Title II, § 4, 67 Stat. 31.

§ 1313. Exceptions from confirmation and establishment of States' title, power and rights

There is excepted from the operation of section 1311 of this title—

(a) all tracts or parcels of land together with all accretions thereto, resources therein, or improvements thereon, title to which has been lawfully and expressly acquired by the United States from any State or from any person in whom title had vested under the law of the State or of the United States, and all lands which the United States lawfully holds under the law of the State; all lands expressly retained by or ceded to the United States when the State entered the Union (otherwise than by a general retention or cession of lands underlying the marginal sea); all lands acquired by the United States by eminent domain proceedings, purchase, cession, gift, or otherwise in a proprietary capacity; all lands filled in, built up, or otherwise reclaimed by the United States for its own use; and any rights the United States has in lands presently and actually occupied by the United States under claim of right;

(b) such lands beneath navigable waters held, or any interest in which is held by the United States for the benefit of any tribe, band, or group of Indians or for individual Indians; and

(c) all structures and improvements constructed

by the United States in the exercise of its navigational servitude. May 22, 1953, c. 65, Title II, § 5, 67 Stat. 32.

§ 1314. Rights and powers retained by the United States; purchase of natural resources; condemnation of lands

(a) The United States retains all its navigational servitude and rights in and powers of regulation and control of said lands and navigable waters for the constitutional purposes of commerce, navigation, national defense, and international affairs, all of which shall be paramount to, but shall not be deemed to include, proprietary rights of ownership, or the rights of management, administration, leasing, use, and development of the lands and natural resources which are specifically recognized, confirmed, established, and vested in and assigned to the respective States and others by section 1311 of this title.

(b) In time of war or when necessary for national defense, and the Congress or the President shall so prescribe, the United States shall have the right of first refusal to purchase at the prevailing market price, all or any portion of the said natural resources, or to acquire and use any portion of said lands by proceeding in accordance with due process of law and paying just compensation therefor. May 22, 1953, c. 65, Title II, § 6, 67 Stat. 32.

§ 1315. Rights acquired under laws of the United States unaffected

Nothing contained in this chapter shall affect such rights, if any, as may have been acquired under any

law of the United States by any person in lands subject to this chapter and such rights, if any, shall be governed by the law in effect at the time they may have been acquired: *Provided, however,* That nothing contained in this chapter is intended or shall be construed as finding, interpretation, or construction by the Congress that the law under which such rights may be claimed in fact or in law applies to the lands subject to this chapter, or authorizes or compels the granting of such rights in such lands, and that the determination of the applicability or effect of such law shall be unaffected by anything contained in this chapter. May 22, 1953, c. 65, Title II, § 8, 67 Stat. 32.

Convention on the Territorial Sea and the Contiguous Zone

PART I: TERRITORIAL SEA

Section I. General

Article 1

1. The sovereignty of a State extends, beyond its land territory and its internal waters, to a belt of sea adjacent to its coast, described as the territorial sea.

2. This sovereignty is exercised subject to the provisions of these articles and to other rules of international law.

Article 2

The sovereignty of a coastal State extends to the air space over the territorial sea as well as to its bed and subsoil.

Section II. Limits of the Territorial Sea

Article 3

Except where otherwise provided in these articles, the normal baseline for measuring the breadth of the territorial sea is the low-water line along the coast as marked on large-scale charts officially recognized by the coastal State.

Article 4

1. In localities where the coastline is deeply indented and cut into, or if there is a fringe of islands along the coast in its immediate vicinity, the method of straight baselines joining appropriate points may be employed in drawing the baseline from which the breadth of the territorial sea is measured.

2. The drawing of such baselines must not depart to any appreciable extent from the general direction of the coast, and the sea areas lying within the lines must be sufficiently closely linked to the land domain to be subject to the regime of internal waters.

3. Baselines shall not be drawn to and from low-tide elevations, unless lighthouses or similar installations which are permanently above sea level have been built on them.

4. Where the method of straight baselines is applicable under the provisions of paragraph 1, account may be taken, in determining particular baselines, of economic interests peculiar to the region concerned, the reality and the importance of which are clearly evidenced by a long usage.

5. The system of straight baselines may not be applied by a State in such a manner as to cut off from the high seas the territorial sea of another State.

6. The coastal State must clearly indicate straight baselines on charts, to which due publicity must be given.

Article 5

1. Waters on the landward side of the baseline of the territorial sea form part of the internal waters of the State.

2. Where the establishment of a straight baseline in accordance with article 4 has the effect of enclosing as internal waters areas which previously had been considered as part of the territorial sea or of the high seas, a right of innocent passage, as provided in articles 14 to 23, shall exist in those waters.

Article 6

The outer limit of the territorial sea is the line every point of which is at a distance from the nearest point of the baseline equal to the breadth of the territorial sea.

Article 7

1. This article relates only to bays the coasts of which belong to a single State.

2. For the purposes of these articles, a bay is a well-marked indentation whose penetration is in such proportion to the width of its mouth as to contain landlocked waters and constitute more than a mere curvature of the coast. An indentation shall not, however,

be regarded as a bay unless its area is as large as, or larger than, that of the semi-circle whose diameter is a line drawn across the mouth of that indentation.

3. For the purpose of measurement, the area of an indentation is that lying between the low-water mark around the shore of the indentation and a line joining the low-water marks of its natural entrance points. Where, because of the presence of islands, an indentation has more than one mouth, the semi-circle shall be drawn on a line as long as the sum total of the lengths of the lines across the different mouths. Islands within an indentation shall be included as if they were part of the water area of the indentation.

4. If the distance between the low-water marks of the natural entrance points of a bay does not exceed twenty-four miles, a closing line may be drawn between these two low-water marks, and the waters enclosed thereby shall be considered as internal waters.

5. Where the distance between the low-water marks of the natural entrance points of a bay exceeds twenty-four miles, a straight baseline of twenty-four miles shall be drawn within the bay in such a manner as to enclose the maximum area of water that is possible with a line of that length.

6. The foregoing provisions shall not apply to so-called "historic" bays, or in any case where the straight baseline system provided for in article 4 is applied.

Article 8

For the purpose of delimiting the territorial sea,

the outermost permanent harbour works which form an integral part of the harbour system shall be regarded as forming part of the coast.

Article 9

Roadsteads, which are normally used for the loading, unloading and anchoring of ships, and which would otherwise be situated wholly or partly outside the outer limit of the territorial sea, are included in the territorial sea. The coastal State must clearly demarcate such roadsteads and indicate them on charts together with their boundaries, to which due publicity must be given.

Article 10

1. An island is a naturally formed area of land, surrounded by water, which is above water at high tide.

2. The territorial sea of an island is measured in accordance with the provisions of these articles.

Article 11

1. A low-tide elevation is a naturally formed area of land which is surrounded by and above water at low-tide but submerged at high tide. Where a low-tide elevation is situated wholly or partly at a distance not exceeding the breadth of the territorial sea from the mainland or an island, the low-water line on that elevation may be used as the baseline for measuring the breadth of the territorial sea.

2. Where a low-tide elevation is wholly situated at a distance exceeding the breadth of the territorial

sea from the mainland or an island, it has no territorial sea of its own.

Article 12

1. Where the coasts of two States are opposite or adjacent to each other, neither of the two States is entitled, failing agreement between them to the contrary, to extend its territorial sea beyond the median line every point of which is equidistant from the nearest points on the baselines from which the breadth of the territorial seas of each of the States is measured. The provisions of this paragraph shall not apply, however, where it is necessary by reason of historic title or other special circumstances to delimit the territorial seas of the two States in a way which is at variance with this provision.

2. The line of delimitation between the territorial seas of the two States lying opposite to each other or adjacent to each other shall be marked on large-scale charts officially recognized by the coastal States.

Article 13

If a river flows directly into the sea, the baseline shall be a straight line across the mouth of the river between points on the low-tide line of its banks.

Section II. Right of Innocent Passage

Sub-Section A. Rules Applicable to All Ships

Article 14

1. Subject to the provisions of these articles, ships of all States, whether coastal or not, shall enjoy

the right of innocent passage through the territorial sea.

2. Passage means navigation through the territorial sea for the purpose either of traversing that sea without entering internal waters, or of proceeding to internal waters, or of making for the high seas from internal waters.

3. Passage includes stopping and anchoring, but only in so far as the same are incidental to ordinary navigation or are rendered necessary by *force majeure* or by distress.

4. Passage is innocent so long as it is not prejudicial to the peace, good order or security of the coastal State. Such passage shall take place in conformity with these articles and with other rules of international law.

5. Passage of foreign fishing vessels shall not be considered innocent if they do not observe such laws and regulations as the coastal State may make and publish in order to prevent these vessels from fishing in the territorial sea.

6. Submarines are required to navigate on the surface and to show their flag.

Article 15

1. The coastal State must not hamper innocent passage through the territorial sea.

2. The coastal State is required to give appropriate publicity to any dangers to navigation, of which it has knowledge, within its territorial sea.

Article 16

1. The coastal State may take the necessary steps in its territorial sea to prevent passage which is not innocent.

2. In the case of ships proceeding to internal waters, the coastal State shall also have the right to take the necessary steps to prevent any breach of the conditions to which admission of those ships to those waters is subject.

3. Subject to the provisions of paragraph 4, the coastal State may, without discrimination amongst foreign ships, suspend temporarily in specified areas of its territorial sea the innocent passage of foreign ships if such suspension is essential for the protection of its security. Such suspension shall take effect only after having been duly published.

4. There shall be no suspension of the innocent passage of foreign ships through straits which are used for international navigation between one part of the high seas and another part of the high seas or the territorial sea of a foreign State.

Article 17

Foreign ships exercising the right of innocent passage shall comply with the laws and regulations enacted by the coastal State in conformity with these articles and other rules of international law and, in particular, with such laws and regulations relating to transport and navigation.

Sub-Section B. Rules applicable to Merchant Ships

* * *

Article 19

1. The criminal jurisdiction of the coastal State should not be exercised on board a foreign ship passing through the territorial sea to arrest any person or to conduct any investigation in connexion with any crime committed on board the ship during its passage, save only in the following cases:

(a) If any consequences of the crime extend to the coastal State; or

(b) If the crime is of a kind to disturb the peace of the country or the good order of the territorial sea; or

(c) If the assistance of the local authorities has been requested by the captain of the ship or by the consul of the country whose flag the ship flies; or

(d) If it is necessary for the suppression of illicit traffic in narcotics drugs.

2. The above provisions do not affect the right of the coastal State to take any steps authorized by its laws for the purpose of an arrest or investigation on board a foreign ship passing through the territorial sea after leaving internal waters.

3. In the cases provided for in paragraphs 1 and 2 of this article, the coastal State shall, if the captain so requests, advise the consular authority of the flag State before taking any steps, and shall facilitate contact between such authority and the ship's crew.

In cases of emergency this notification may be communicated while the measures are being taken.

4. In considering whether or how an arrest should be made, the local authorities shall pay due regard to the interests of navigation.

5. The coastal State may not take any steps on board a foreign ship passing through the territorial sea to arrest any person or to conduct any investigation in connexion with any crime committed before the ship entered the territorial sea, if the ship, proceeding for a foreign port, is only passing through the territorial sea without entering internal waters.

Article 20

1. The coastal State should not stop or divert a foreign ship passing through the territorial sea for the purpose of exercising civil jurisdiction in relation to a person on board the ship.

2. The coastal State may not levy execution against or arrest the ship for the purpose of any civil proceedings, save only in respect of obligations or liabilities assumed or incurred by the ship itself in the course or for the purpose of its voyage through the waters of the coastal State.

3. The provisions of the previous paragraph are without prejudice to the right of the coastal State, in accordance with its laws, to levy execution against or to arrest, for the purpose of any civil proceedings, a foreign ship lying in the territorial sea, or passing

through the territorial sea after leaving internal waters.

* * *

PART II. CONTIGUOUS ZONE

Article 24

1. In a zone of the high seas contiguous to its territorial sea, the coastal State may exercise the control necessary to:

(a) Prevent infringement of its customs, fiscal, immigration or sanitary regulations within its territory or territorial sea;

(b) Punish infringement of the above regulations committed within its territory or territorial sea.

2. The contiguous zone may not extend beyond twelve miles from the baseline from which the breadth of the territorial sea is measured.

3. Where the coasts of two States are opposite or adjacent to each other, neither of the two States is entitled, failing agreement between them to the contrary, to extend its contiguous zone beyond the median line every point of which is equidistant from the nearest points on the baselines from which the breadth of the territorial seas of the two States is measured.

PART III. FINAL ARTICLES

Article 25

The provisions of this Convention shall not af-

fect conventions or other international agreements already in force, as between States Parties to them.

Article 26

This Convention shall, until 31 October 1958, be open for signature by all States Members of the United Nations or of any of the specialized agencies, and by any other State invited by the General Assembly to become a Party to the Convention.

* * *

Convention on the High Seas

Article 1

The term "high seas" means all parts of the sea that are not included in the territorial sea or in the internal waters of a State.

Article 2

The high seas being open to all nations, no State may validly purport to subject any part of them to its sovereignty. Freedom of the high seas is exercised under the conditions laid down by these articles and by the other rules of international law. It comprises, *inter alia*, both for coastal and non-coastal States:

(1) Freedom of navigation;

(2) Freedom of fishing;

(3) Freedom to lay submarine cables and pipelines;

(4) Freedom to fly over the high seas.

These freedoms, and others which are recognized by the general principles of international law, shall be excercised by all States with reasonable regard to the

interests of other States in their exercise of the freedom of the high seas.

* * *

Article 6

1. Ships shall sail under the flag of one State only and, save in exceptional cases expressly provided for in international treaties or in these articles, shall be subject to its exclusive jurisdiction on the high seas. A ship may not change its flag during a voyage or while in a port of call, save in the case of a real transfer of ownership or change of registry.

2. A ship which sails under the flags of two or more States, using them according to convenience, may not claim any of the nationalities in question with respect to any other State, and may be assimilated to a ship without nationality.

* * *

Article 8

1. Warships on the high seas have complete immunity from the jurisdiction of any State other than the flag State.

2. For the purposes of these articles, the term "warship" means a ship belonging to the naval forces of a State and bearing the external marks distinguishing warships of its nationality, under the command of an officer duly commissioned by the government and whose name appears in the Navy List, and manned by a crew who are under regular naval discipline.

Article 9

Ships owned or operated by a State and used only on government non-commercial service shall, on the high seas, have complete immunity from the jurisdiction of any State other than the flag State.

Article 10

1. Every State shall take such measures for ships under its flag as are necessary to ensure safety at sea with regard *inter alia* to:

(a) the use of signals, the maintenance of communications and the prevention of collisions;

(b) the manning of ships and labour conditions for crews taking into account the applicable international labour instruments;

(c) the construction, equipment and seaworthiness of ships.

2. In taking such measures each State is required to conform to generally accepted international standards and to take any steps which may be necessary to ensure their observance.

Article 11

1. In the event of a collision or of any other incident of navigation concerning a ship on the high seas, involving the penal or disciplinary responsibility of the master or of any other person in the service of the ship, no penal or disciplinary proceedings may be instituted against such persons except before the judicial or administrative authorities either of the flag State or of the State of which such person is a national.

2. In disciplinary matters, the State which has issued a master's certificate or a certificate of competence or license shall alone be competent, after due legal process, to pronounce the withdrawal of such certificates, even if the holder is not a national of the State which issued them.

3. No arrest or detention of the ship, even as a measure of investigation, shall be ordered by any authorities other than those of the flag State.

* * *

Article 30

The provisions of this Convention shall not affect Conventions of other international agreements already in force, between States Parties to them.

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