THE POLLUTION PROBLEM IN THE WATERS OF THE INNER ATLANTIC BIGHT

The disposal of industrial wastes by barge into the outer waters of the inner Atlantic bight—sometimes referred to as the "Mudhole" area—calls attention to what is probably the most serious and difficult problem in fisheries conservation yet encountered on our Atlantic coast. It is the problem of conserving the ocean and tidewater area within a 20 mile radius of Scotland Lightship—including Upper and Lower New York Bays, Raritan Bay, and Sandy Hook Bay—which is of vital importance to what are, collectively, among the most valuable fisheries of the Atlantic coast. To date, the progressive increase of pollution within the area has reached the point where large tidal and ocean sections have already been so damaged as completely to wipe out certain of the fisheries and to severely injure some of the others. Along with this damage to the fisheries has come the increased menace to health from polluted bathing beaches and bad atmospheric conditions, with the result that heavy pressures are now being applied toward the abatement of some of the pollution in certain of the tidewater areas.

The disposal by barge farther from shore of titanium dioxide wastes (similar in composition to the "pickle liquor" from steel mills), activated sewage sludge, and dredged bottom materials, is one of the results of these pressures.

When the offshore disposal of pollutants by barge is to be evaluated in the light of the conservation problem, two facts must be considered: First, the offshore waters within this inner Atlantic bight are probably of equal, or greater, importance to the fisheries when compared with the tidewater section; second, the damage already wrought in the tidal area has been the result of the gradual increase in the quantity of disposals and pollutants, and not the result of any one project. In fact, it seems more than likely that if "dilution" was to be the sole basis for permitting any single disposal project to exist, then nearly all disposals in the damaged area would continue: each would be contributing only a small amount of damage in terms of the whole area.

In short, pollution is a problem of gradual increase in the quantity of disposals and pollutants and a progressive change in environ-

ment toward an unsuitable condition for either the aquatic life itself or for its capture and use by man. Pollution is by no means just a matter of fish kills and "toxicity"; and to evaluate a disposal merely upon this basis, together with the degree of dilution, is to foster the gradual increase of pollution. It represents the piecemeal approach to conservation which William Vogt, in his excellent book "Road to Survival", has so convincingly shown to have far reaching and disastrous results.

Type of Consideration Given to the Problem

In view of the foregoing, it is discouraging to note that the consideration given to this industrial waste disposal project, by various individuals and groups (N. Y. Conservation Dept. excepted) has been almost entirely of this "piecemeal" type. The "woods have not been seen for the trees" and the conservation problem involved has been conceived in terms of the disposal project, rather than vice versa. In other words, the conservation problem has been conceived in terms of possible lethal or toxic effects from this one disposal, rather than in terms of the total fishery environment and unfavorable, progressive change through this and other disposals, present and future. And as we have seen, lethal effects are by no means necessary for the complete destruction of a fishery.

Some of the details of the "official" considerations given to this disposal project are also significant in the light of our conservation problems. For example, much attention and weight have been given to certain opinions sought and received from competent and outstanding oceanographers, and professors of chemistry and zoology, in the unfounded and irrational belief that proficiency *per se* in these fields of science is a guarantee of equal competence and experience in the field of conservation. Some of the comments of these "experts" are revealing: one expert, for instance, recommended dumping "in the Cholera Bank area" when east winds were expected, little realizing, apparently, that the waters on these tiny banks are only about 60′ deep and that the banks are literally crowded with fishing craft during large parts of the year; another expert stated that the "precedent would be an extremely good one to set . . . and would be a great improvement to the biological economy of the country" (whatever that

phrase may mean) little realizing, apparently, that the dumping point then being considered was the approximate center of one our country's most concentrated and valuable fishery areas. Other experts stated that the wastes should be discharged at the surface, while others recommended it be dumped near the bottom, etc., etc. One searches all these comments in vain for evidence of an awareness and understanding of the historical facts of our pollution problems as these relate to the conservation of fishery resources. And in only one opinion was mention made of the value of the area as a fishery resource. This opinion, incidentally, recommended disposal far outside the fishery area.

Finally, it is also of significance that the bias of the opinions noted above was brought into the picture partly as the result of another apparent, curious belief, namely: that disinterestedness is essential for objectivity.

The Value of the Area as a Fisheries Resource

In order fully to appreciate the seriousness and difficulty of this conservation problem, it must be realized that we are dealing with a situation wherein one of the world's largest centers of population and industry is adjacent to one of the world's most valuable fisheries area; and the dilemma is further heightened by our traditional disregard and unawareness of the natural balances essential for the maintenance of our resources. Still further, we have been in the habit of judging the merits of the type of use to which a resource environment should be put, solely upon the basis of whether the "indutrial" use is more valuable than the resource which the environment supports. This shortsighted habit has often been mistakenly considered to be justified under such terms as: "the progress of civilization", and "the wheels of progress". Indeed these very terms have been used by some in this present situation, and one of the "experts" earlier referred to informed the writer: "after all, we must have our storage batteries and other things."

The inner bight area is unique as a fisheries resource. Its outer waters are a concentration point for many food and game fishes which migrate seasonally to this region. They are caught there by hundreds of thousands of persons each year, and this activity represents, in boat fares alone, more than $1,000,000. Its value as a "human refuge"

has an inestimable, recreational importance, and its economic and social significance is reflected in real estate developments, salt water fishing equipment, and other activities along the coasts of New Jersey and Long Island. It has been shown by Westman and Neville*, for instance, that more than 2000 chartered tuna fishing trips were made from the village of Freeport alone, during 1941; that this activity accounted for approximately 9,000 man fishing days and represented only slightly less than one-fourth of the tuna fishing activity in the inner bight area that year, which incidentally took more than 2,000,000 lbs. of tuna.

Shortly after the tuna, albacore, and ocean bonito have moved out of this area in the fall, Boston mackeral move in. Last year, the concentration of mackerel in the vicinity of Ambrose and Scotland Lightships was so great, it is reported that some of the "open" sportfishing boats from Sheepshead Bay (some of which are more than 100′ in length) waived fares and, in effect, used the passengers as commercial food fishing crews. The result was that thousands upon thousands of pounds of mackerel were harvested for market purposes while at the same time providing sport and recreation for the anglers. (It should be mentioned that there is an abundance of mackerel on our Atlantic coast).

In addition to the foregoing fisheries, there are aprpoximately fourteen bottom fishing grounds distributed throughout the area. These grounds are used by the approximate 200 "open" angling boats of nearby Long Island and New Jersey. During the spring, these boats specialize in mackerel and blackfish; while during the summer they catch fluke, porgies, sea bass and blackfish. In late fall and early winter, codfish are also taken in large numbers by these boats.

The outer waters of the inner Atlantic bight also support an otter trawl fishery, which in the past has accounted for about 3,000,000 lbs. of whiting annually; in addition to perhaps 100,000 lbs. of fluke. Lobster and sea bass pots are also present in these waters.

In the more inshore, ocean waters, i.e. close to the beaches, there exist: 1. surf fishing for striped bass; 2. surf fishing for weakfish; 3. one of the heaviest concentrations of surf clams in Long Island waters, which cannot be used for food purposes on account of polution

* The Tuna Fishery of Long Island, New York. (Published by Nassau County, New York, May, 1942.)

(Long Island produced about 300,000 bushels of surf clams for food purposes each year).

With reference to what we have considered as the "tidewater" area, i.e. Upper and Lower New York Bays, Raritan Bay, and Sandy Hook Bay, it should be pointed out that the Lower Hudson River supports a managed shad fishery, which varies from about 2,000,000 to 5,000,000 lbs. annually, and represents the spawning ground for this fishery. The Lower Hudson River is also a spawning ground for striped bass. More than a quarter of a million pounds of the shad fishery are harvested by nets in Lower New York Bay. The Raritan River also supported a shad fishery at one time, but this has gone the way of the Delaware shad fishery, and no longer exists: pollution and other environmental changes have taken their toll.

Finally, studies now being conducted by the Bureau of Marine Fisheries of the New York Conservation Department suggest that this tidewater area of the inner bight, together with the waters of extreme western Long Island Sound, is the most important spawning area of the menhaden in the waters between Cape May, New Jersey, and Montauk Point, New York. Upwards of 200,000,000 lbs. of menhaden are taken in this larger portion of the Atlantic bight, and this alone represents one of the largest fisheries on our Atlantic coast. Menhaden are highly tolerant of pollution; in fact seem to thrive upon the enrichment from some degree of organic waste disposal. But menhaden, too, have their limits; and if the importance of these tidewaters is as great as is now indicated, they need to be preserved from further environmental change.

Immediate Effects from Barged Disposals

At the various hearings held on this disposal method two years ago, and at meetings of other groups since that time, the writer has emphasized the following:

1. During the research studies on the tuna fishery conducted in 1941, and since that time, it has been observed that the discharge of sewage sludge by barge near Scotland Lightship, produces large areas or blocks of turbid water; that these blocks hold together for long periods of time (a day or more during relatively calm weather) and frequently drift down upon the anchored tuna fishing boats. When

this occurs, it spoils the fishing and many boats pull anchor. It was pointed out that the barged industrial wastes could be expected to produce even larger blocks of turbidity with correspondingly greater effects, if not far more serious ones.

2. The use of any piecemeal approach in evaluating whether or not barged disposals should be made, i. e. the toxic or lethal effects from one type of waste, and the conducting of observations, experiments, etc. thereon, could only result in encouraging the further increase of pollution in the area.

3. Science is limited in such matters, in that damage has to take place before science can actually measure it; and even in such an event, science may require years to do so, if at all.

In view of the foregoing, some recent events seem significant:

1. Tuna fishing captains have reported on several occasions that blocks of turbidity from the barged industrial waste have interfered with their fishing and necessitated their weighing anchor.

2. At a meeting of the Atlantic States Marine Fisheries Commission held in New York early this year, it was stated by Mr. Seth Hess, Director of the Interstate Sanitation Commission, that plans were to double the amount of sewage sludge being disposed by barge in the "mudhole" area.

3. The preliminary report on the disposal of industrial wastes at sea by Woods Hole Oceanographic Institution, shows that large areas or blocks of turbidity are indeed formed by the operation; further that the iron content of the sea water was as much as 100 times that which could be expected in the area, at a distance of 15 miles from the dumping barge, and that plankton were "stunned" at a distance of nearly one mile (the farthest reported upon).

4. The piecemeal approach, which the Woods Hole Oceanographic Institution report represents, was responsible for a feature article on page one of Section II of the *New York Herald Tribune* for Sunday, July 25, which states in headlines: "Following Scow That Empties Sulphuric Acid in Sea, They (scientists of Woods Hole Oceanographic Institution) Find Answers to Industry's Question: Where to Dispose of Chemical Waste?".

This same approach has also been responsible for other, similar conclusions, in other publications. In short, it has already encouraged the further increase of pollution in the area; and to those scientists who may claim that this is not their own responsibility, other scientists can justifiably say "Nonsense!" The time has long past when scientists can assume this irresponsible attitude, and long get away with it.

Future Needs

In view of the alarming inadequacy of the consideration given to this pollution problem, and because of the fact that waters outside the three-mile limit are a jurisdictional no-man's land, two immediate steps would appear urgent:

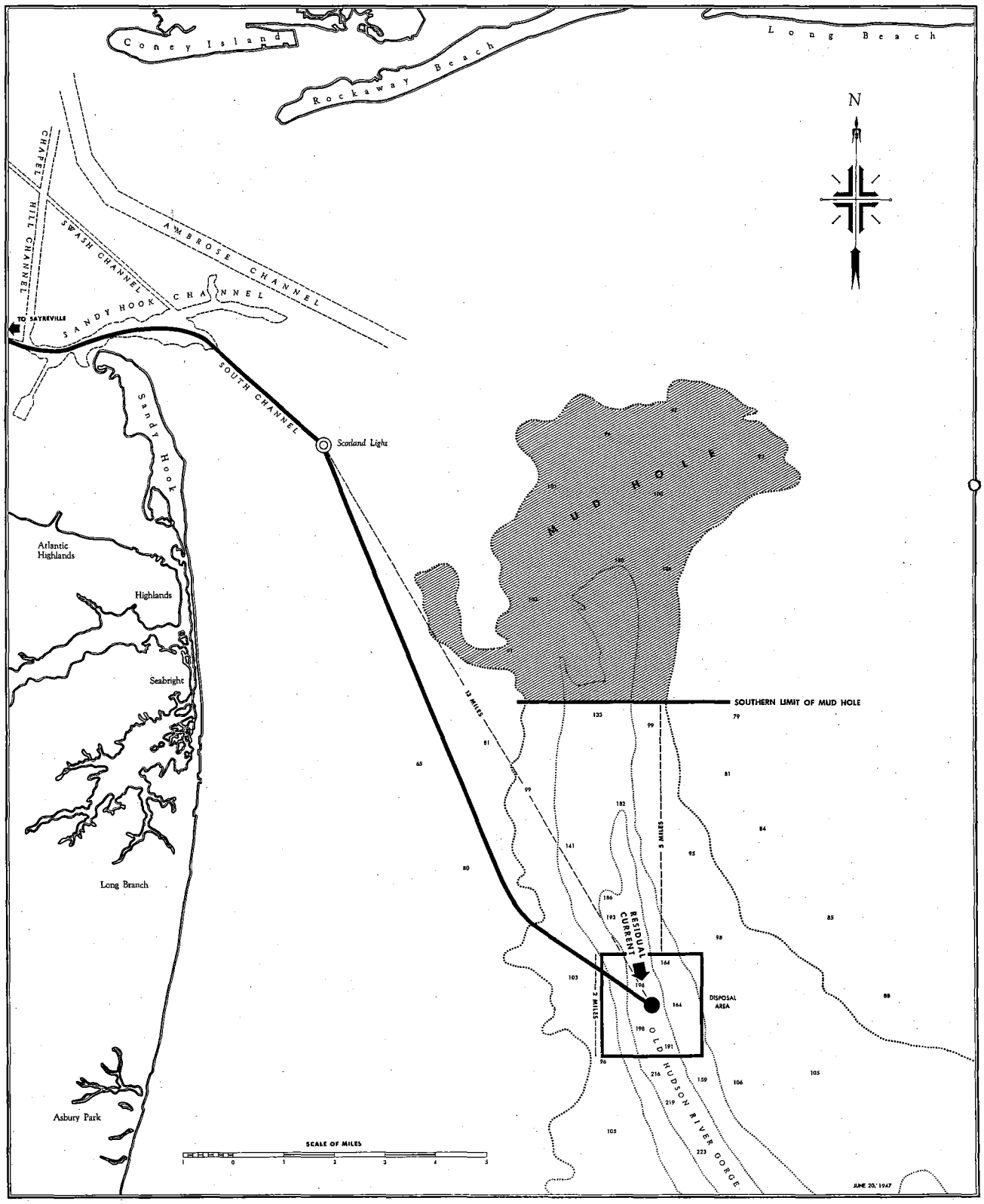
1. A campaign of public enlightenment into the nature of the conservation problem involved and the urgency of its solution.

2. The establishment of an authority which is reasonably immune to political expediency and other pressures, to check further increase of pollution in the area and to abate some of the pollution now within it.

3. The location of disposal areas outside fishery areas, and from where pollutants cannot enter the fishery areas. This should not discourage the development of methods for reclaiming, treating, or otherwise using to advantage, wastes at their source. (This was the position taken by the N. Y. Conservation Dept. at the hearings held on the subject two years ago.)

J. R. Westman
Feeport, New York
August 15, 1948

NATIONAL LEAD COMPANY WASTE DISPOSAL AREA



Dr. L. A. Walford, Washington, D. C. June 30, 1948

Chief, New Eng. Fishing Banks Inv., Woods Hole, Mass.

Conferences with Dr. James R. Westman,
Biologist, New York State Conservation Dept.

Mr. Jack Brawley,
Salt Water Fishing Editor,
New York Journal American.

Mr. O. G. Dale, Jr.,
Vice President,
Atlantic Coast Anti-Pollution League.

On June 22 I went to New York at the invitation of Dr. Westman to confer with him and with the other people mentioned regarding the pollution in the New York area. I was met at the plane by Dr. Westman and Jack Brawley.

We three discussed the sports fishery, the pollution situation, and the investigations being conducted. Everyone was very cordial.

The next day I had lunch with Westman, Dale and John Lloyd, Public Relations Representative of the National Lead Company. It was Westman's idea to explain the situation to Lloyd and Dale and to sound out the National Lead Company on the possibility of additional funds for a study of the pollution problem as a whole. From these discussions I learned or have good reason to believe that the following things exist or have happened:

(1) Westman and his immediate superior, Alfred Tucker, have been subjected to pressure to either stop their opposition to the acid dumping by the National Lead Company or come up with a concrete reason why it should be prohibited.

(2) The alternate process for disposal of the acid which Westman had claimed was available appears to be a patented process developed by an independent engineer. As far as can be learned it is still in a test-tube stage and none of the people I talked with have definite information that it is practical or available.

(3) Opposition to the Fish and Wildlife Service is not violent any more.

(4) The National Lead Company has selected several alternate points at which they would be willing to dump their waste acid if requested.to do so. In connection with this, I stressed that no change should be made in the present plan without full information and consultation with the Atlantic States Marine Fisheries Commission, the Woods Hole Oceanographic Institution and the Fish and Wildlife Service.

(5) Jack Brawley has had a chart prepared by some of the more experienced sports fishermen showing the major sport fishing areas. I am impressed by the extremely poor information on the fishing localities, species and amount taken, and value of the fishery. There is almost no information available on the activities of the fishing fleets which would permit a rational coordination of fishing and waste disposal activities.

(6) There are numerous rumors to the effect that other companies expect to take advantage of the precedent set by the National Lead Company and dispose of other waste products at sea. Certain municipalities also are planning to collect sewage into trunk lines and dispose of it at sea.

(7) Westman contends that while the National Lead Company may not interfere with fishing, the increasing disposal of waste in the New York bight will sooner or later cause serious damage to the fishery. I agree that there is considerable merit in his contention and I believe that an intelligent consideration of the problem can be made only after a careful survey of the kind and extent of fishing and the kind and extent of pollution.

WFR:ICN

William F. Royce.

cc - Mr. Raymond Buller.

From: The National Lead Company
Titanium Division
111 Broadway
New York, N. Y.

Background Memorandum on
Waste Disposal From the
Sayreville Pigment Plant.

The material in this memorandum is primarily for background information. If you desire to use any or all of it, it is released for publication upon receipt.

The operation of the 265-foot waste-disposal barge, "Sayreville," to begin late in 1947, climaxes thirteen years of intensive study of waste disposal problems of its Sayreville, N. J. plant by the Titanium Division of the National Lead Company -- years in which $10,000,000 was spent on research, experiment and operation of various disposal methods.

Dilute sulphuric acid -- acid constitutes about 8.5 per cent of the total liquid waste from the Sayreville plant -- is an unavoidable waste from the production of titanium dioxide pigment, an industrial process essential to our economy. Rapid expansion of the Sayreville plant since it was opened in 1934 has made the problem of waste disposal an increasingly difficult one. Illustrative of the magnitude of the task is the fact that Sayreville's acid disposal problem is fifteen times greater than that of the largest steel mill in America.

The program on which the Titanium Division now is embarking at an additional cost of $2,000,000 -- contemplates the further dilution and neutralization of the waste in the sea at a point over the rocky Hudson River Gorge, thirteen miles south-southeast of Scotland Light Ship, 10 miles from the New Jersey Coast, and about 5 miles south of the nearest extreme limit of the fishing grounds known as the "Mud Hole."

The most intensive study, carried on not alone by the Titanium Division's technical staff, but by independent sources, indicates that this is the only practical method of disposing of this unavoidable waste from the production of titanium pigment -- giving due consideration not only to the exigencies of production, but to the demands of public health, the question of water pollution, and the interests of private and commercial fishermen and sportsmen generally.

The testimony of the most competent experts available indicates that the injury to marine life, if any, will be so small as to be insignificant. There will be no measurable alteration in the number, location or habits of fish in the area, nor any determinable diminution in the volume of plankton -- microscopic marine life which is the base of the food cycle in the sea -- as a result of these operations.

It is the purpose of this memorandum to state the background of the problem, the research and experience that have led to this solution, and the method of operation which will be followed in our program of disposal at sea.

I. Titanium

The Sayreville Plant of the Titanium Division is located on the South Bank of the Raritan River, between the New Jersey Communities of South Amboy and Sayreville.

Its principal product is titanium dioxide, a commercially important and unique pigment, with many industrial uses for which there is no satisfactory substitute.

As a pigment, titanium is whiter than any other, and has hiding power -- the ability to cover a surface -- five to ten times greater than any other pigment. Titanium has a higher refractive index -- or light reflecting quality -- than diamonds.

Titanium pigment is also unique in that it can withstand heat without losing its whiteness. For that reason, titanium pigment is used in white-wall tires, and in other white rubber products in which the pigment must withstand the heat of the vulcanizing process without yellowing.

The heat-resistant qualities of the pigment also make possible its use in high temperature baking enamels.

Titanium is used extensively in enameling electric refrigerators and other enameled products, in coated papers, and in many other products in which whiteness, hiding power, and heat resistance are important.

II. Sources of Titanium

Relatively common in non-commercial quantities, titanium ore (called "ilmenite") comes today in sufficient volume for industrial use from only three places in the world -- Norway, India and the MacIntyre Development in the Adirondack Mountains in New York.

The MacIntyre Mine was first opened more than a century ago, but was abandoned when it was found that impurities in the iron -- among them what we now know as titanium -- made commercial use of the ore impractical at that time.

The mine was reopened at the instance of the government shortly before World War II, when the world situation made the continued availability of foreign supplies uncertain. Iron ore from the mine is sold today -- but the mine is operated chiefly for the titanium, or ilmenite, ore.

The ore is brought to Sayreville, where it is treated to recover the titanium dioxide. An important part of the process demands the use of sulphuric acid to separate the pigment from the ore.

III. The Disposal Problem

At maximum operation early in 1948, the Sayreville Plant will have to dispose of 4,350 tons of liquor a day. The total tonnage will contain 368 tons of sulphuric acid, and 474 tons of iron sulphate. This corresponds to a chemical analysis of 8.5% sulphuric acid, and 10.9% iron sulphate. The balance is water.

As noted above, the magnitude of the dispoal problem has been constantly increasing since the plant was opened, as the result

of expansion programs in 1936 and 1938, further expansions necessitated by war requirements in 1941 and 1944, and the current expansion which began in 1945.

When the plant was first put into operation in 1934, the volume of waste was small. The solids were disposed of in lagoons, and the remainder of the waste was dumped into the Raritan River. The quantity entering the river was so small and the dilution so great, that it was virtually impossible to detect its presence after it had entered the river.

As the plant grew, however, waste disposal became an increasing problem; and the company began an intensive research campaign in an effort to solve it. The company drew on the work done by the Mellon Institute on steel pickling liquor disposal, on its own technical staff, for it is a leader in the acid recovery business, and on research, suggestions and recommendations made by independent consulting engineers and waste disposal experts.

Even in the initial stages, it was demonstrated that disposal of any part of the waste in ponds near the plant was unsatisfactory, because of the enormous volume involved. Neutralization of the acid with lime before it was discharged into the pond was tried -- but it was impractical for a number of reasons.

Neutralization of the anticipated waste would require more than 150,000 tons of lime a year, and would result in waste products of more than 1,500,000 tons a year -- containing more than 100,000 tons of iron hydroxides and more than 340,000 tons of calcium sulphate in close physical combination with the iron impurities, and it would still be necessary to dispose of this enormous tonnage of solids.

Even if enough land were available for a dumping ground, and the waste dumped in pits or ponds over a period of years, the material would endanger the underlying water table of the entire area both for industrial and private use. Our technicians advise us that oxidation and leaching of the products of neutralization would occur, and chemical solutions would result which would permeate the water table.

The danger to the water supply would probably not evidence itself for the first few years of the operation, but, when finally it became evident, it would be too late to remedy the damage.

Nor could neutralized waste be dumped in the Raritan River, for, although the acid would be neutralized, the calcium sulphate which would result is insoluble, and would sink to the bottom of the channel -- quickly filling up the river and blocking navigation.

For these reasons, neutralization of the waste products offered no solution to the problem -- would, in fact, only aggravate it if continued over any substantial period of time.

There has been widespread discussion of acid recovery as an alternative.

The Sayreville pigment plant is an enormous user of acid -- consuming between $11,000 and $12,000 worth every day. It would obviously be ideal if a process could be developed by which we could recover and re-use acid from our waste -- thus materially lowering the cost of new acid required in the production of titanium pigment. It is in the company's interest to continue research in an effort to get the "last squeal out of the pig," to make the maximum use, in other words, of acid which at present is wasted.

In addition to the loss from having to discard acid, the present program for disposal at sea calls for the abandonment of an original investment of $1,463,000 in existing experimental recovery plants -- and the expenditure of approximately $2,000,000 for the barge, shore installations and adaptation of the plant to the new disposal method.

Certainly National Lead Company and its Titanium Division would not undertake these tremendous costs if a satisfactory method of acid recovery could be found. The company has drawn on the work done by the Mellon Institute in steel pickling liquor disposal, on the research of its own technical experts and upon the experiments of independent consulting engineers and waste disposal experts in an effort to find a workable method of recovering this acid -- without success.

The work done by the Mellon Institute on the waste products of the iron and steel industry -- even though the scale of waste in these industries is much smaller than that facing the Sayreville plant -- has failed to show any satisfactory solution to the problem. The Mellon Institute's work, incidentally, is similar to our own problem, since the steel industry's waste product consists of dilute sulphuric acid contaminated with iron salts.

Because of the tremendous savings that could be effected by a practical process for acid recovery, National Lead Company will continue to call upon its own experts, and upon other sources for continued study of the problem.

One thing should be made clear at this point. Notwithstanding the above facts, some persons claim that there are processes of acid recovery which will do this job. The National Lead Company has thoroughly

investigated every known method -- either existing or in the course of development -- and not one is practical for the particular problem at the Sayreville plant.

IV. Practical Disposal

The net effect of thirteen years of research in every form of disposal demonstrates that the dilute sulphuric acid waste from the Sayreville plant must be literally thrown away until and unless technical scientific advances provide a method, not yet attained, from either a physical or economic point of view for using them.

The problem of throwing away 4,350 tons of waste liquor a day is not an easy one. This waste comes from the plant every day it operates -- 24 hours a day, 365 days a year. The only way to halt its accumulation is to shut down the plant -- which presently gives direct employment to approximately 1,150 persons in the area, and indirectly affects the livelihood of hundreds of thousands of New Jersey citizens and their families.

It cannot, as we have shown, be pumped into pits or lagoons adjacent to the plant with or without neutralization. There is not enough land available for the long-run disposal requirements -- and if there were, such a staggering amount of waste might ultimately contaminate the underlying water table for the entire region.

The State of New Jersey ordered the company to cease its disposal of the waste in the Raritan River. And in the absence of any usable method of recovery there is only one possible solution to the problem: Disposal at sea.

V. Disposal at Sea

When the failure of other methods left disposal at sea as the only alternative, the National Lead Company began an extensive series of studies to determine the best practical area for disposal, and the most advisable method of discharge from the barge which would carry the waste to sea.

Marine biologists and oceanographers were consulted; practical tests which simulated, so far as possible, the conditions which would result from the disposal were conducted; and the problem was presented to the Fish and Wildlife Service of the Department of the Interior and the Atlantic States Marine Fisheries Commission.

The final plan for disposal of the waste, and the selection of the designated disposal area was worked out by the Fish and Wildlife Service in cooperation with the Atlantic States Marine Fisheries Commission and the company, after all the available expert advice had been considered.

The designated disposal point is a two-mile square area over the old Hudson River Gorge -- a deep, rocky channel through the ocean bottom through which the Hudson River once flowed to the edge of what is now the continental shelf. This gorge -- through which a residual current of .2 knots per hour flows out to sea -- is considerably deeper than the surrounding area. At no point is the depth of water less than 150 feet -- and in most parts of the disposal area the depth is in excess of 180 feet.

It is located some thirteen miles south-southeast of the Scotland Light Ship, approximately ten miles off the New Jersey coast, and its northern limit is five miles from the most extreme

southerly boundary of the fishing grounds known as the "Mud Hole." (See chart attached.)

In announcing its findings on Disposal at Sea, the Fish and Wildlife Service declared that "it has been found that the acid which will be widely distributed in the very great volume of sea water will be quickly neutralized, and that other waste products will be rapidly dissipated by ocean currents. The Service believes, therefore, that the hazard to the fisheries will be insignificant."

To assist in assembling the information upon which the Fish and Wildlife Service based its opinion, Mr. Wayne D. Heydecker, Secretary-Treasurer of the Atlantic States Marine Fisheries Commission, called together a panel of that organization's consultants. The opinions of such authorities as Dr. Columbus O'D. Iselin and Dr. Alfred C. Redfield, respectively Director and Assistant Director of the Woods Hole Oceanographic Institution, Dr. Norris Rakestraw of Brown University, Dr. A. E. Parr, Director of the American Museum of Natural History, Dr. Thurlow C. Nelson of Rutgers University, Dr. G. E. Hutchinson of Yale University, Dr. Ross F. Nigrelli of the New York Zoological Society, and others were obtained. Records of oceanic circulation in the area off New York were provided by the U. S. Coast and Geodetic Survey and opinions were expressed by representatives of sportsmen's and commercial fishery organizations.

The waste will be discharged from the barge, capable of carrying 3,200 tons -- or more than three-fourths of a day's waste -- while the barge is in motion in the designated area. The waste will be discharged from a point 10 to 15 feet beneath the surface of the ocean, and it is estimated that it will take two hours to complete the discharge of the complete load of 3,200 tons of waste.

The waste will consist of 8.5 per cent acid -- or 270 tons out of the total liquor of 3,200 tons -- and 10.9 per cent iron sulphate -- or 349 tons. Turbulence of the water in the wake of the barge will so agitate and "mix" the waste liquor with seawater that a further dilution to one part of acid in some 30,000 parts of seawater will take place almost immediately --- a dilution so great that it will be almost impossible to detect the presence of the acid.

With such a dilution -- or of any dilution even approaching it -- the alkalinity of the seawater will almost instantly neutralize the acid, in the opinion of experts -- so that actually no acid will be present in the ocean after the barge has completed its discharge of waste matter.

The method finally chosen -- discharge beneath the surface from a moving barge -- in the opinion of many experts, represents the best possible solution. It was felt that to discharge the waste on the bottom from a stationary barge would leave relatively high concentrations of the waste in a small area where, because of the lack of agitation of the water on the ocean bed, it would require a longer period for dilution and neutralization.

In horizontal discharge near the surface, the dilution will be so great, and the process of neutralization so swift, that there can and will be no effect upon fish even in the immediate vicinity of the discharge. Some experts believed that there might be some effect upon the plankton at the immediate point and moment of discharge, before extreme dilution and neutralization could take place; but that such a localized, momentary effect would be insignificant. There are approximately 344 million plankton in a cubic yard of seawater, and

so rapidly do they multiply, that any plankton destroyed in the immediate path of the barge would be quickly replaced with fresh organisms.

In this connection, it is important to emphasize certain things:

1. There can be no harmful, cumulative effect from the discharge of waste acid and waste solids.

Sea water contains sodium bicarbonate in substantial quantities. Dilute sulphuric acid dropped into sea water, then, immediately will react chemically with that sodium bicarbonate to form carbon dioxide, the food for minuscule plankton, plus sodium sulphate, one of the ever-present salts that makes sea water "salty," plus plain water. The iron sulphate, the 349 tons per barge load, will react in a series of simple chemical reactions with the sea water and bicarbonate to form iron oxide. With the great dilution contemplated, it is probable that only part of the iron oxide may be present in the solid form as plain, ordinary rust. Thus, a small amount of rust may be present after discharge, but primarily there will be water, carbon dioxide for the plankton to feed on, sodium sulphate which already is present in sea water, and iron salts in solution. Any harmless solids which might remain after neutralization will be pushed toward the continental shelf by that .2 knot-an-hour residual current flowing down the old Hudson River Gorge over which the disposal will take place.

2. The discharge of waste will not take place in a fishing ground. The designated area, at its closest point, is five miles away from the extreme circumference of the area known as the "Mud Hole," a shallower area in the ocean which is noted as a fishing

ground both for amateur and commercial fishermen. Actually, many expert fishermen define the "Mud Hole" within narrower limits than those indicated on the attached chart, and place the true "Mud Hole" considerably more than five miles north from the designated disposal area.

The area designated for disposal has a jagged, rocky bottom -- and for that reason is not used by experienced commercial fishermen because of the danger of damage to nets. Experienced amateur sportsmen who confine their fishing to the area of the "Mud Hole" are not known to visit the dumping area.

The residual current, which moves directly away from the "Mud Hole," eliminates the possibility that any of the waste may reach that fishing area.

3. <u>There can be no effect upon the shore of the beaches of New Jersey</u>.

The waste will be disposed of ten miles out at sea -- and the residual current will carry it away from the shore. Actually, it would be possible for a person to swim in the wake of the barge as it discharges its waste without suffering any harm from -- or being conscious of -- the waste. There can and will be no "acid odor" from the diluted, neutralized waste even in the designated area -- and certainly none at any point on the distant shore. Nor can there be any damage to nets, ropes or other objects in the ocean from the disposal.

VI. The "Sayreville"

The acid-disposal barge "Sayreville" is, according to available records, the biggest non-self-propelled craft of its kind

ever built. It has an over-all length of 264 feet, $3\frac{1}{4}$ inches; a breadth of 43 feet, and a designed draft of 13 feet, 8 inches, with a displacement of 3,925 tons.

The hold of the barge is equipped with eight rectangular tanks, each measuring 15 feet 4 inches wide, 44 feet long, and 15 feet deep and four cylindrical sludge tanks approximately 12 feet in diameter and 9 feet high.

It is estimated that it will require an average of $9\frac{1}{2}$ trips a week -- or nineteen trips every two weeks, carrying 3,200 tons on each trip -- to dispose of the maximum waste from the Sayreville plant; a schedule that calls for continuous operation of the barge in a regular "ferry service" between the plant and the disposal area. Actual dumping will take about two hours of each trip. Storage facilities will be provided on shore to care for an accumulation of four and a half days' waste if the regular trips of the barge are interfered with by weather, or by drydocking and cleaning.

Detailed study of weather conditions off the Port of New York for the past ten years shows no tie-up of navigation because of weather conditions longer than $2\frac{1}{2}$ days -- and a search of weather bureau records for the past forty years indicates no tie-up of greater duration. And, the tug towing the "Sayreville" will be equipped with all latest aids to navigation, including radar.

VII. Operation

A permit for the barge to operate from the Port of New York has been granted by the supervisor of the port.

Announcements of the date on which the first waste liquor will actually be dumped at sea from the barge will be made to all

interested persons, including the press -- and ample facilities will be made available so that all those interested may accompany the barge on its initial trip for all pertinent observations.

Facilities will also be provided for continued observations by scientists from the Fish and Wildlife Service, the Atlantic States Marine Fisheries Commission and others during the operation of the barge.

The National Lead Company is confident that these observations will confirm the opinion of scientific experts that this method of disposal is a practical solution of a major industrial problem -- one that serves the interest of public health, of private and commercial fishermen, and of the public generally.

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