

Job Segment Report

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Project No. MP-2R-1

Date: February 4, 1959.

Name of Project: Pollution Abatement in Regions M-4 through M-9.

Period Covered: July 1, 1958 - November 1, 1958. Job No. F-4

Abstract: The Columbia Southern Chemical Corporation at Corpus Christi was polluting Nueces Bay by destroying the vegetated flats capable of serving as nursery grounds and directly killing aquatic life with a toxic pollutant. A change in the route of the disposal line decreased the concentration of the toxic pollutant and emptied the wastes into a cove of little biologic importance. At the present time there is no damage done to the aquatic life and vegetation in the harbor, but a disposal line that empties into Nueces Bay may be slowly reducing the size of the bay, creating a hazard to fishermen, and destroying the habitat for marine forms.

Objective: To determine the toxicity of Columbia Southern Chemical Corporation's effluent and the presence and concentration of toxic materials.

Procedure: Samples were taken from the three stations set up whenever possible.

Station 1 is at the outfall;

Station 2 is twenty-five (25) yards away from the outfall; and

Station 3 is fifty (50) yards away from the outfall.

Information was obtained from the personnel of the corporation and a chemical analysis and a bio-assay was determined from each sampling.

Findings: Columbia Southern Chemical Corporation is a chemical plant located in the Nueces Bay Channel. Its products are chlorine, mud additives and caustics. Water from the harbor is used at a rate of 500 gallons per minute as a coolant and as a means for disposal of chemical and municipal wastes.

Chlorine is the most toxic pollutant to aquatic life found in the waste waters and it is emitted into the waste waters as sniffing gas. This is a heavy, yellowish gas with a suffocating odor that is retained in the chlorine bottles. It is vacuummed off and released in the cooling water forming liquid chlorine. This liquid chlorine is then released into a thirty-six inch (36") pipe that flows for about 300 yards before emptying into an open culvert. It then flows down the culvert into an isolated cove in the ship channel.

Originally there were two routes of disposal for the cooling water. One line lead from the plant under the Nueces Bay harbor and emptied into Nueces Bay. The immediate area of disposal was in a channel 100' x 900' dredged for barges to unload mudshell. The perimeter of the channel was shallow, vegetated flats capable of serving as nursery grounds for aquatic life. The chlorine content range was 50 to 70 milligrams per liter (Table I) from the outfall. The color of the water at the outfall was a yellowish green and had a strong pungent odor. The color extended past station 3 and diminished upon entering the bay. However, the chlorine demand of the bay water was great enough so that the residual chlorine content was reduced to 4.0 mg/l at the point of disposal and 1.0 mg/l at the mouth of the channel entering the bay. Toxicity studies (Table II) indicated the water had a 10% dilution volume for a median tolerance limit at station 1 and a 40% dilution volume at station 3. On

TABLE I

Chemical Analysis of the Nueces Bay Disposal Line

Station I	Cl ₂	Station II	Cl ₂	Station III	Cl ₂	Date	pH
72.0 mg/l		6.7 mg/l		1.9 mg/l		7-10	8.6
60.0 mg/l		3.5 mg/l		.9 mg/l		7-14	7.3
55.0 mg/l		4.1 mg/l		.3 mg/l		7-24	8.9
40.0 mg/l		2.9 mg/l		.4 mg/l		7-29	8.2
26.0 mg/l		2.0 mg/l		.9 mg/l		8-6	7.9

TABLE II

Toxicity Computed in Average Kills for Period July 1 - October 1

	Station I	Station II	Station III
100%	Violent reaction - 5 pin perch dead within 15 minutes.	Very weak condition - dead within thirty minutes.	Weak - dead within three hours
90%	Violent reaction - resp. rate doubled dead within 30 mins.	Weak - dead within two hours.	Weak - four dead within five hours.
70%	Weak and resp. in- creased - dead within two hours.	Weak - four dead within four hours.	Weak - three dead; two very weak.
50%	Sluggish and weak - within four hours.	Very weak - three dead and two very weak, six hours.	Weak - two dead; three very weak.
40%	Sluggish and weak - three dead, two very weak within five hours.	Very weak - one dead.	Three dead - two alive.
10%	Sluggish and weak - but some activity.	All alive.	All alive.

several occasions dead fish, usually mullet and shad, were seen at all stations. Aquatic vegetation along the perimeter of the channel was decreasing, and the residual chlorine content was too high for aquatic life to inhabit the area.

This route of disposal was shut down and all of the waste water was released into another line that went under Navigation Boulevard south of the swing bridge and emptied into a cove of little biological importance. This area was dredged out leaving the mouth of the channel shallow. This reduced the exchange of water with the bay and allowed most of the settled solids to stay in the cove. The cooling water runs through an open culvert for two hundred yards (200), and through agitation and aeration the chlorine content is reduced. The chlorine content of the outfall prior to entering the bay averaged 15 mg/l from the eleven (11) samples taken (Table III). The average was less than 2.0 mg/l at the point of disposal, and the mouth of the cove has a residual chlorine content of less than .1 mg/l. Toxicity studies (Table IV) of this area indicated the water had a 100% dilution volume for a forty-eight (48) hour TLM, and has little effect, at the present time, on aquatic life in Nueces Bay. The perimeter of the cove is a secondary shore and is not under water at any time, hence, not capable of serving as nursery grounds for aquatic life.

Columbia Southern has another disposal line that creates a hazard to fishermen and to the bay proper. This line empties calcium sulfate (CaSO_4) and during the past ten years has built a false shore for about two hundred (200) yards into the bay. This was built up at the rate of about ten inches (10") a month until the ebbing of the tide and the flow of the river carried the precipitate out into deeper waters and dispersed it. However, with the recent building of the dam at Calallen, most of the river water is retained and therefore the Nueces Bay current is reduced. This is destroying a considerable area in Nueces Bay and is actually filling in a good part of it.

The false shore is packed and is capable of supporting a man's weight for about one hundred (100) yards from land. The physical indications are the same to the waters edge, but the remaining area begins to get soft and mushy. At the waters edge there is "no bottom" and this could be hazardous to fishermen.

Comments: Since the changing of the waste flow line to the isolated cove there is little damage from this source to Nueces Bay. However, since the concentration of toxic pollutant varies and the flow line of caustics into Nueces Bay, continuous checks should be made to encourage pollution abatement. The outfall of precipitated calcium sulfate should be stopped immediately before further damage is inflicted on the bay habitat.

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Date Approved: 7 August 1957

TABLE III
Nueces Bay Channel Disposal

Station I Cl ₂	Station II Cl ₂	Station III Cl ₂	Date	pH
17 mg/l	1.8 mg/l	.2 mg/l	9-2	8.2
19 mg/l	2.3 mg/l	.1 mg/l	9-15	8.6
23 mg/l	3.5 mg/l	.3 mg/l	9-19	8.9
21 mg/l	2.6 mg/l	.2 mg/l	9-25	7.9
8 mg/l	.8 mg/l	.1 mg/l	10-6	7.3
12 mg/l	2.9 mg/l	.1 mg/l	10-21	7.8
14 mg/l	1.2 mg/l	.1 mg/l	11-6	8.2
19 mg/l	2.7 mg/l	.2 mg/l	11-7	8.7
7 mg/l	.6 mg/l	.1 mg/l	11-17	7.6
10 mg/l	1.8 mg/l	.3 mg/l	12-2	7.9
12 mg/l	1.9 mg/l	.2 mg/l	12-4	8.2

TABLE IV
Toxicity Computed on Average Kills in Isolated Cove

	Station I	Station II	Station III
100%	Five pin perch weak; dead within two hours.	Weak - one dead within three hours.	Five alive after forty-eight hours.
90%	Five alive after forty-eight hours.	Five p.p. alive after twenty-four hours.	Five alive after forty-eight hours.