

## Job Report

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Project Name: Pollution Abatement in Region V  
Period Covered: November 1, 1960 to October 1, 1961 Job No. F-6

### Detection and Measurement of Pollution in Corpus Christi Harbor

**Abstract:** There are eight industries using water from Corpus Christi Harbor either as a coolant for industrial equipment or as a disposal area for process waste. This disposal of effluent keeps the perimeter of the harbor contaminated constantly. A shifting of the pollution load by tidal exchange dilutes toxic components and thus, together with self-purification, renders the harbor channel relatively free of pollution.

The largest contribution to pollution in Corpus Christi Harbor is from ships losing oil while entering and leaving the harbor, or from line breaks or leaks while loading ships.

Corpus Christi Harbor is not classified as an area of biologic importance. With the industrial boom and increased traffic in the area, it is almost impossible to eliminate pollution. The ultimate aim is to keep pollution at a minimum and retain it within the harbor. It is evident from all samples at Station 9 that the pollution load is either retained within the harbor or is diluted to the extent of rendering it non-toxic before emptying into Corpus Christi Bay.

**Objective:** To detect and measure the cumulative toxic effects of pollutants from industrial plants located in Corpus Christi Harbor and their effects on the marine environment in Corpus Christi Bay.

**Procedure:** Nine stations were established in Corpus Christi Harbor from the harbor bridge to the extreme north end as follows:

- Station 1 - Adjacent to Suntime Refinery in the channel.
- Station 2 - At Suntime Refinery's disposal outfall into the harbor.
- Station 3 - In the channel adjacent to Corn Products.
- Station 4 - At disposal point of American Smelting's outfall.
- Station 5 - In channel between American Smelting Company and the lift bridge.
- Station 6 - Entrance of Sinclair Refinery and Columbia Southern's waste from a cove connecting to the harbor.
- Station 7 - In the channel adjacent to Sinclair and Columbia Southern outfall.
- Station 8 - In the channel adjacent to disposal area of Pontiac Refinery's effluent.
- Station 9 - Under the harbor bridge.

These stations were sampled monthly, chemically preserved and chemically analyzed for phenols, oil and sulfides as determined according to Standard Methods, Tenth Edition, within a 24-hour period. pH and dissolved oxygen

content was determined in the field. pH measurements were taken with a Beckman, Model G, glass electrode meter. Dissolved oxygen tests were determined by the Rideal-Stewart modification of the Winkler Method. This method was necessary since interfering substances of iron salts, organic matter and excessive suspended matter were known to be present.

Findings: Within the project year the entrance of Corpus Christi Harbor was dredged and widened. Previously, flushing of the harbor by tidal exchange was limited by a narrow entrance. By enlarging this passageway, the volume of outflow has increased, providing more dilution water and moving the dead, contaminated water, previously shifted between Stations 6 and 8 (Job No. F-1, 1959), out giving a complete water exchange up to Station 5, the approximate end point of pollution.

Suntide Refinery, located at the extreme north end of the harbor, has a disposal outfall approximately two miles from the refinery. The refinery waste empties into the harbor through Tule Lake. The effluent travels over sandy flats and the oily contents are filtered from the waste. Dilution water in Tule Lake reduces toxic components in the waste to a safe level prior to emptying into the harbor (Job No. F-1, 1961). Samples taken at Stations 1 and 2 (Table 1) indicated no toxic pollutants were present.

There is no immediate disposal of waste at Station 3 other than municipal waste from Corn Products. Analytical data were collected here to determine if contaminated water from refinery disposal downstream was flushed to this area during a tidal exchange. There was no indication of toxic components present in any of the samples.

Station 4 was established to check on toxic contaminants attributable to the American Smelting plant. In producing inorganic chemicals, a sulfite acid gas escapes and is emitted into the cooling water, forming a sulfuric acid waste. Periodically this waste escapes through a bleed line from the plant. The flow is less than five gallons per minute and enters the harbor through a drainage ditch approximately 100 feet long. The acid water dissipates in the ditch water and the pH at the exit point is equivalent to the normal pH of the harbor water.

Station 5 was near the approximate end of water surge during an incoming tide. Samples taken during an inflow of water were compared with pH measurements at Stations 6 and 7. pH measurements increased during an ebb tide and coincided with readings at Station 4 which remained relatively constant during an exchange. There were no toxic pollutants measured in any of the samples taken.

Sinclair Refinery and Columbia Southern Chemical Company empty their waste into a cove dredged by Columbia Southern to unload mud shell. An open, 50-foot wooden flume was constructed by Sinclair for waste disposal to enhance aeration, thus reducing sulfides in the waste. Chlorine, present in Columbia Southern's waste, partially neutralizes, by dephenolization, a toxic phenol compound found in Sinclair's waste. The conditions at Station 6 indicate the confluent waste was free of toxic components with the exception of a periodic oil spill.

There were no pollutants measured at Station 8 during an incoming tide. A phenol content of .8 parts per million and oil in two samples was detected during an ebb tide. On these two occasions the wind was from the north, pushing the oil out that had been retained in the harbor by the prevailing southeast winds. Dissolved oxygen content was always low during an outgoing tide, indicating the bulk of the pollution load in the harbor is shifted to this area during a tidal exchange.

Oil was the only toxic component found at Station 9. The current was severe during a tidal exchange, possibly diluting any toxic components to the extent of being non-detectable.

Table 1

## Chemical Analysis of Corpus Christi Harbor

<u>Date</u>	<u>Station</u>	<u>Phenols</u>	<u>pH</u>	<u>Sulfides</u>	<u>Oil</u>	<u>D.O.</u>	<u>Tide</u>
November 10, 1960	1	0.0	7.8	---	0.0	5.8	In
	2	0.0	7.8	---	0.0	6.2	
	3	0.0	7.7	---	0.0	5.9	
	4	0.0	7.8	---	0.0	6.1	
	5	0.0	7.1	---	0.0	---	
	6	0.0	7.0	0.0	0.0	---	
	7	0.0	7.1	0.0	21.3	---	
	8	0.0	7.3	0.0	29.3	---	
	9	0.0	7.5	0.0	0.0	---	
December 2, 1960	1	---	7.9	---	0.0	---	Out
	2	---	7.6	---	0.0	---	
	3	---	7.7	---	0.0	---	
	4	0.0	7.8	---	0.0	---	
	5	0.0	7.8	---	0.0	---	
	6	0.0	7.2	0.0	0.0	---	
	7	0.0	7.2	---	29.6	---	
	8	Neg	7.0	0.0	31.4	4.3	
	9	0.0	7.6	0.0	39.4	6.2	
January 11, 1961	1	---	7.9	---	0.0	---	In
	2	---	7.6	---	0.0	---	
	3	---	7.7	---	0.0	---	
	4	0.0	7.6	---	0.0	---	
	5	0.0	7.2	0.0	0.0	---	
	6	0.0	7.1	0.0	29.4	---	
	7	0.0	7.2	0.0	8.9	---	
	8	---	7.2	0.0	0.0	5.5	
	9	0.0	7.4	0.0	0.0	6.1	
February 7, 1961	1	---	7.9	---	0.0	6.5	Out
	2	---	7.8	---	0.0	6.9	
	3	---	7.8	---	0.0	8.2	
	4	0.0	7.9	0.0	0.0	6.3	
	5	0.0	8.1	0.0	0.0	6.9	
	6	0.0	7.3	0.0	0.0	7.2	
	7	0.0	7.3	0.0	0.0	5.9	
	8	.9	7.4	0.0	0.0	4.9	
	9	0.0	7.6	0.0	0.0	5.9	
March 28, 1961	1	---	7.6	---	0.0	---	Out
	2	---	7.7	---	0.0	---	
	3	---	7.7	---	0.0	---	
	4	0.0	7.9	---	0.0	---	
	5	0.0	7.9	0.0	0.0	5.1	
	6	0.0	7.3	0.0	0.0	6.1	
	7	0.0	7.3	0.0	5.6	6.3	
	8	---	---	0.0	0.0	5.1	
	9	0.0	7.4	0.0	0.0	6.2	

--- Not Sampled

Table 1 (Continued)

<u>Date</u>	<u>Station</u>	<u>Phenols</u>	<u>pH</u>	<u>Sulfides</u>	<u>Oil</u>	<u>D.O.</u>	<u>Tide</u>
April 7, 1961	1	---	7.8	---	0.0	---	In
	2	---	7.7	0.0	0.0	---	
	3	---	7.7	---	0.0	---	
	4	0.0	7.7	0.0	0.0	---	
	5	0.0	7.2	0.0	0.0	---	
	6	0.0	7.2	0.0	0.0	---	
	7	0.0	7.2	0.0	0.0	---	
	8	Neg		0.0	0.0	6.7	
	9	0.0	7.4	0.0	0.0	6.9	
May 3, 1961	1	0.0	7.9	---	0.0	8.1	In
	2	---	7.8	---	0.0	7.2	
	3	---	7.9	---	0.0	6.3	
	4	0.0	7.9	---	0.0	6.2	
	5	0.0	7.1	0.0	0.0	6.1	
	6	0.0	7.2	0.0	0.0	6.5	
	7	0.0	7.2	0.0	5.2	6.2	
	8	Neg		0.0	19.4	6.1	
	9	0.0	7.8	0.0	0.0	6.4	
June 12, 1961	1	---	7.9	---	0.0	---	Out
	2	---	7.8	---	0.0	---	
	3	---	7.9	---	0.0	---	
	4	0.0	7.9	---	0.0	---	
	5	0.0	7.9	0.0	0.0	---	
	6	0.0	7.4	0.0	0.0	---	
	7	0.0	7.4	0.0	29.3	---	
	8	Neg		0.0	19.6	5.9	
	9	0.0	7.5	0.0	0.0	6.3	
July 14, 1961	1	0.0	7.8	---	6.0	---	Out
	2	---	7.8	---	0.0	---	
	3	---	7.8	---	0.0	---	
	4	0.0	7.8	---	0.0	---	
	5	0.0	7.9	0.0	0.0	6.5	
	6	0.0	7.0	0.0	0.0	6.9	
	7	0.0	7.2	0.0	0.0	---	
	8	0.0		0.0	0.0	6.2	
	9	0.0	7.5	0.0	0.0	6.5	
August 4, 1961	1	---	7.8	---	0.0	---	Out
	2	---	7.7	---	0.0	---	
	3	---	7.7	---	0.0	---	
	4	0.0	7.8	---	0.0	---	
	5	0.0	7.8	---	0.0	6.3	
	6	0.0	7.6	0.0	15.1	6.2	
	7	0.0	7.4	0.0	19.4	6.2	
	8	0.0	7.6	0.0	0.0	5.3	
	9	0.0	7.6	0.0	0.0	5.9	

--- Not Sampled

Table 1 (Continued)

<u>Date</u>	<u>Station</u>	<u>Phenols</u>	<u>pH</u>	<u>Sulfides</u>	<u>Oil</u>	<u>D.O.</u>	<u>Tide</u>
September 1, 1961	1	0.0	7.8	---	0.0	5.8	Out
	2	0.0	7.7	---	0.0	6.2	
	3	0.0	7.7	---	0.0	6.0	
	4	0.0	7.6	---	0.0	5.9	
	5	0.0	7.6	0.0	0.0	6.1	
	6	0.0	7.3	0.0	0.0	5.9	
	7	0.0	7.3	0.0	9.2	5.8	
	8	0.8	7.4	0.0	0.0	4.5	
	9	0.0	7.4	0.0	0.0	6.2	

--- Not Sampled

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