FE

1 D MATERIAL: MONSANTO INSURANCE COVERAGE LITIGATION

CC: MCM

TO: Clayton Callis G5WA
George Roush G2WG

attached are copies of the text and transparencies that I will present to the Social Responsibility Committee on Friday July 22. See you at the dry run Thursday @ 3:30.

R L Fitzgerald

Jeff City?

DEPOSITION EXHIBIT

Roush 2
2-18-93 CZK

MCO 9327590

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LOCATION

The Texas City plant is north of Galveston and south of Houston as shown in Figure 1. The North 80 Site is 2 miles north of the plant as shown in Figure 2. The site is bounded on the east by Galveston Bay, on the north by a canal connected to Dollar Bay, on the west by a municipal sewage treatment plant and old municipal landfill, and on the south by Houston Oil and Minerals property as shown in Figure 3.

The North 80 Site is divided almost equally into two parts by the North-South Texas City storm water flood control canal and levee constructed in 1964 by the Corps. of Engineers as part of the Texas City flood control system. Canal water levels are controlled by a pump station at the north end which pumps water to Dollar Bay.

PROBLEM

The purpose of the North-80 Site investigation was to evaluate the most probable sources, movement pathways, and migration mechanics associated with the occurrence of floating organic materials (globules and an oily sheen) found in the canal and seeping from the west canal bank. Monsanto had used this general area in years past for disposal of various waste products in landfills and impoundments.

APPROACH

The methodology included an initial identification of discharge areas for floating organic materials, chemical analysis of same, the development of the

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soil sequence for the canal bottom and subsurface soils and the location of the waste deposit sources.

Floating organic materials sampling was initiated in mid-September 1982, and four surveys were completed.

A bathymetric survey was conducted in the canal to determine depth to, and thickness of, bottom sediments. Sediment samples were taken for contamination analysis. Fluorescence spectrophotometry as shown in Figure 4, was utilized to identify oily contaminants not visible to the eye.

A resistivity survey was conducted to assist in locating areas of contamination not readily visible on the surface, and as a guide to locate boreholes for soil sampling and monitor well placement. This divide can remotely sense changes in soil resistance (caused by contaminants) to depths of 12/15 feet.

A total of 29 boreholes were drilled to obtain samples of subsurface soils and to provide information on sediment type and depth. The borings are shown on Figure 5. Twenty-two boreholes were drilled on land, and 7 were drilled from a barge in the canal. All boreholes were geophysically logged with downhole instruments to assist in geologic and hydrologic definition. Drill cuttings were examined with a fluorescence spectrophotometer to identify the presence of oily contaminants not readily seen by the eye.

Selected boreholes (17) were converted to monitoring wells by placement of well screens and cement/clay grout seals. Each well was pumped to remove drilling contaminants and water samples taken. Water levels were taken once the fluid level stabilized.

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Tests were conducted in the field to measure the permeability of the various soil types (a measure of water flow capacity).

Water and soil samples were subjected to Gas Chromatography/Mass Spectrometry (GC/MS) analysis to identify contaminant types. Various volatile organic compounds and extractable chlorinated hydrocarbons were identified.

GEOLOGY

The sediments in the area can be divided into three categories: man-made fill, canal sedimentation, and natural subsurface soils. The dominant man-made fill in the area is the gypsum settling pond. Fill in the pond is composed of the silty to clayey soft sediments removed from Brazos River water used at the plant site. The canal was the borrow source for construction of the storm protection levee. Silt and clay has been settling out of the stormwater in the canal since its construction. Up to 12 feet of sediment has accumulated to-date.

The natural subsurface soils in the upper 60 feet of the sediment at the site are of two distinct origins: strandplain deposits and deltaic deposits. The type of depositional environment strongly controls the sediments ability to transmit groundwater. Strandplain deposits allow equal vertical and horizontal groundwater movement. Deltaic deposits favor horizontal flow by one or more orders of magnitude.

The strandplain deposits are found to depths of about -23 feet MSL. The

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Deltaic deposits are found below the strandplain and to maximum depths of [illegible] feet MSL.

Geologic cross-sections were constructed to assist in understanding the vertical and lateral distribution of geologic units. Four of these cross-sections are depicted on Figure 5; cross-sections A-A', B-B', C-C' and D-D'. These cross-sections are too large to display by overhead projector so I have taped them to the wall for clarity.

Cross-section A-A' shows the soil sequence on the east side of the canal (west side of the levee). The sediment sequence indicates strandplain beach sands (equal horizontal and vertical permeability) overlying Deltaic Levee and marsh deposits (horizontal permeability < than vertical).

Section A-A' indicates a strandplain sand unit uniformly overlying deltaic silty, clayey sands and intermittant clay seams.

Section B-B' along the west bank shows a similar pattern with the addition of deltaic channel fill deposits (latterally discontinuous, or lenses) and man-made (waste) fill.

Section C-C' across the south end of the site shows strandplain sand; Deltaic silts, sands & clays; surface fill; waste fill; and canal sediments.

Section D-D' across the north end of the site is similar to C-C" although no waste fill sites were encountered. The hard deltaic clay (represented in red) may form a continuous vertical flow barrier at the N-80 site.

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HYDROLOGY

There are two major aquifers in the region: the Chicot and Evangeline. The shallowest primary source of water is the basal sand in the Chicot aquifer about -390 to -540 feet MSL. The regional groundwater flow direction is SE to NW due to heavy pumping for mnuicipal use. The local groundwater flow prior to construction of the Levee is shown in Figure 6. The groundwater flow was strongly influenced by the construction of levee and stormwater canal as shown in Figure 7.

Figure 8 shows the groundwater flow relationship looking E-W across the site. Notice that the water level in the gypsum pond is very high (+14 feet MSL), and the canal is -5 feet MSL. This situation provides a hydraulic head at the gypsum pond which drives pond water seepage downward and predominantly eastward into the canal. Also note that Galveston Bay water seeps westward under the dike into the canal. Water in the canal is kept pumped down to approximately -5 to -8 feet MSL to provide storm surge capacity as part of the flood protection strategy.

CURRENT STATUS

Figure 9 shows the local groundwater gradient relationship at the N-80 site. Note that the high pond level drives water rapidly eastward and northward with much reduced flow to the south. This hydraulic driving force is responsible for the movement of contaminants and must therefore be removed or greatly reduced.

If nothing is done, contaminants will continue to leach into the stormwater

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canal at rapidly increasing rates. Groundwater flow is not a rapid process; however, the contaminants seen to-date are the leading edge of those to follow. It is expected that the release rate of contaminants will rapidly escalate with time. The first step that must be taken to control this release rate is to reduce the hydraulic head created by the gypsum pond. Jerry [redacted] Rinaldi will discuss this topic in his presentation.

I would be happy to entertain any questions you might have.

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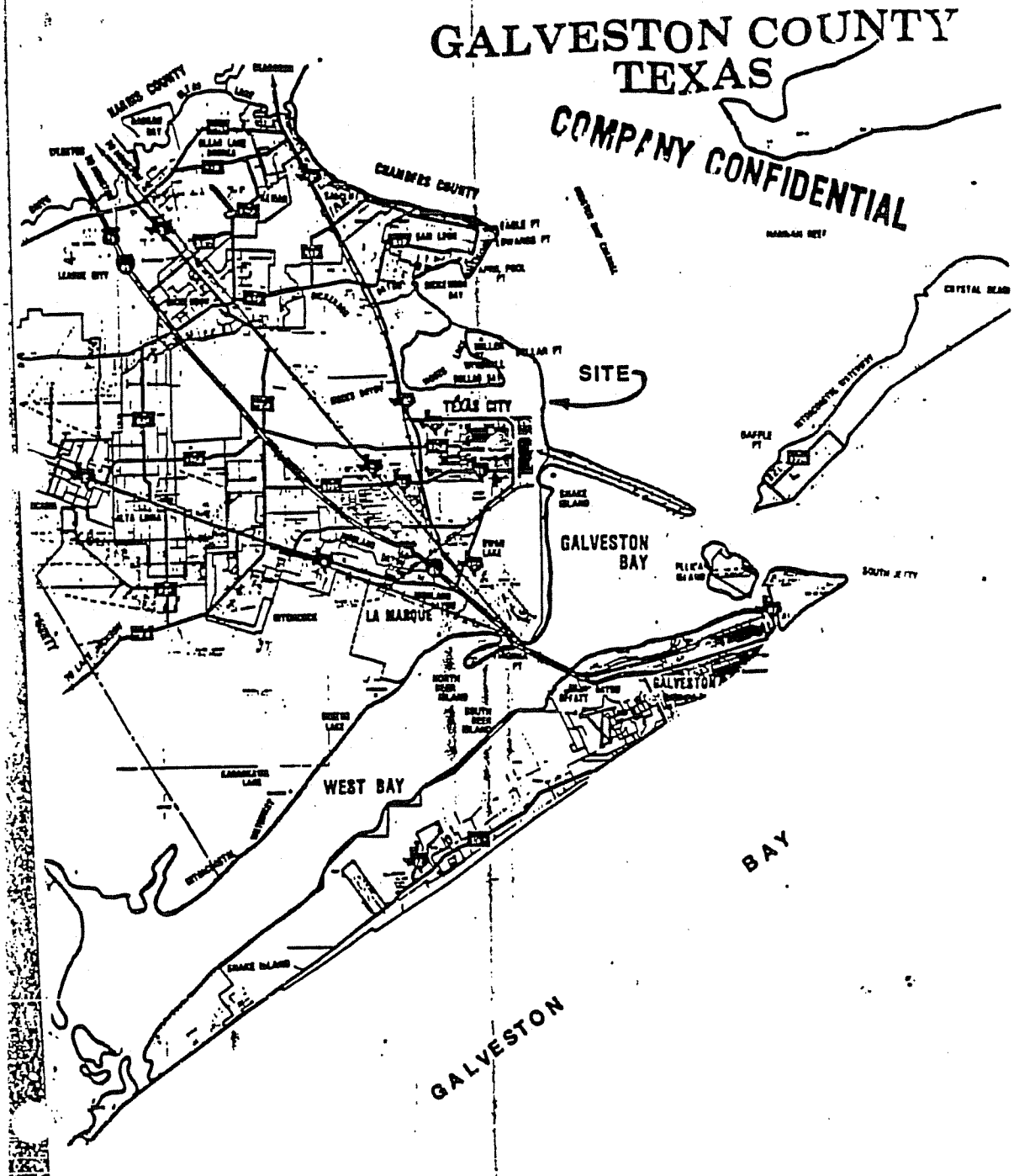

FIG 1

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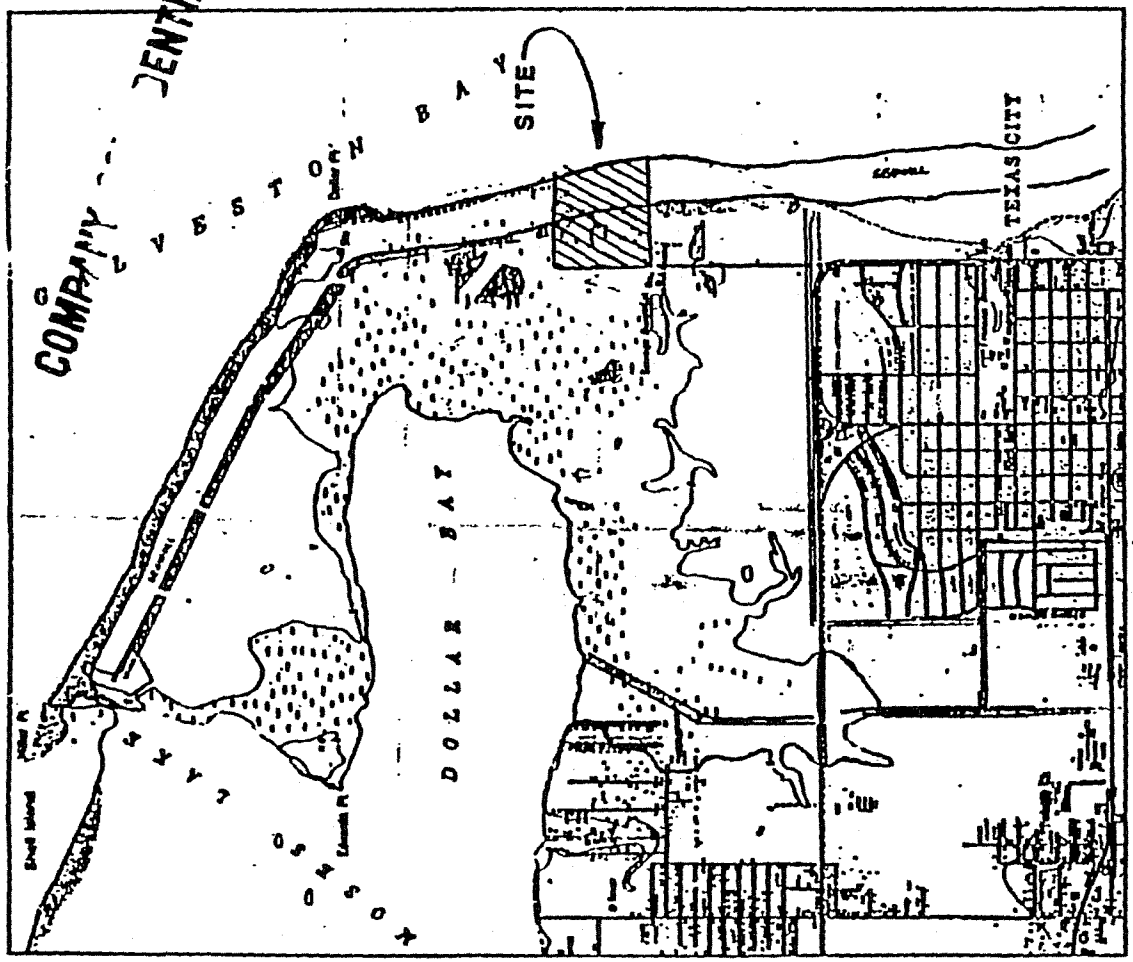

SITE LOCATION
FIG 2

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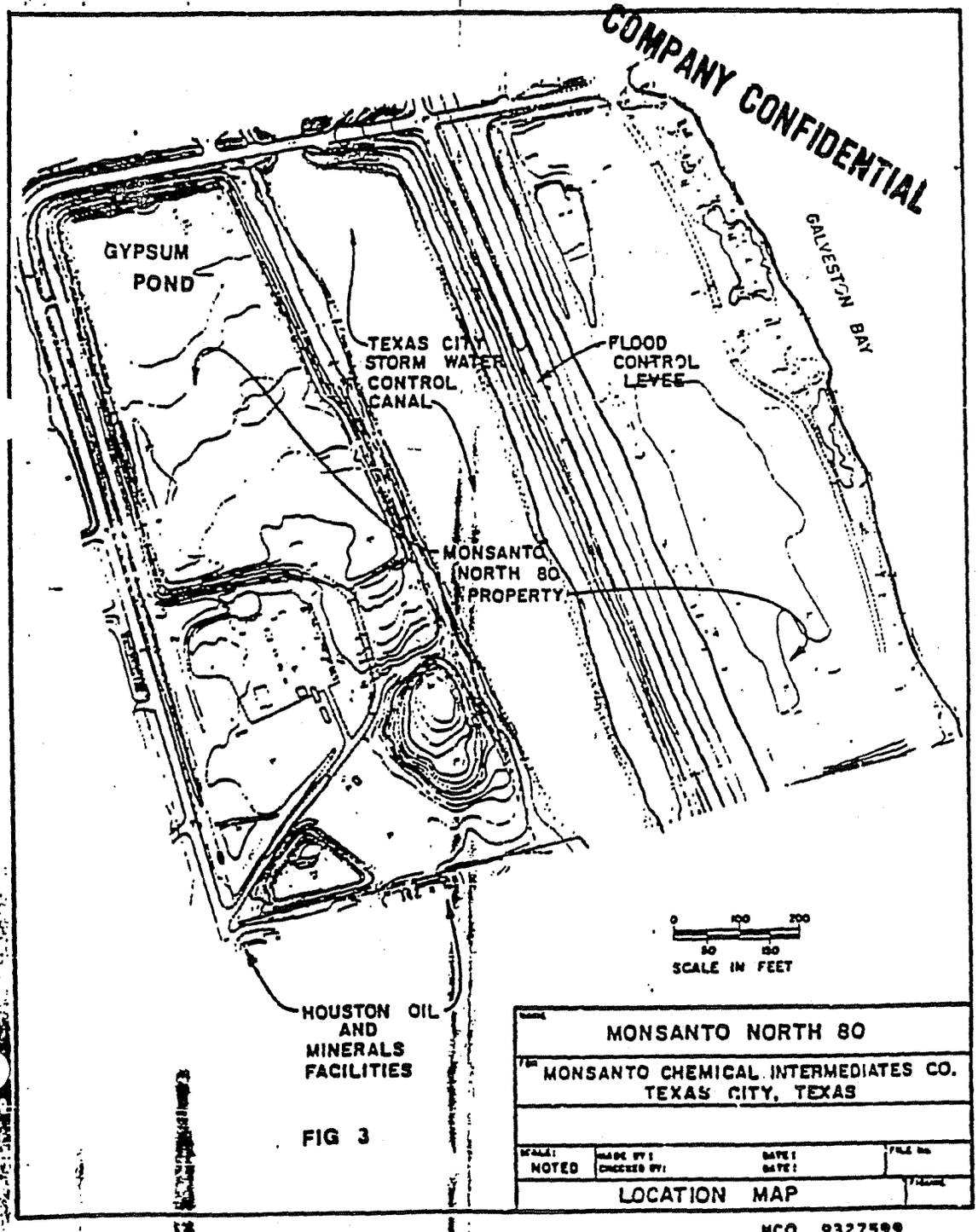

FIG 3

	MONSANTO NORTH 80
	MONSANTO CHEMICAL INTERMEDIATES CO. TEXAS CITY, TEXAS
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	LOCATION MAP

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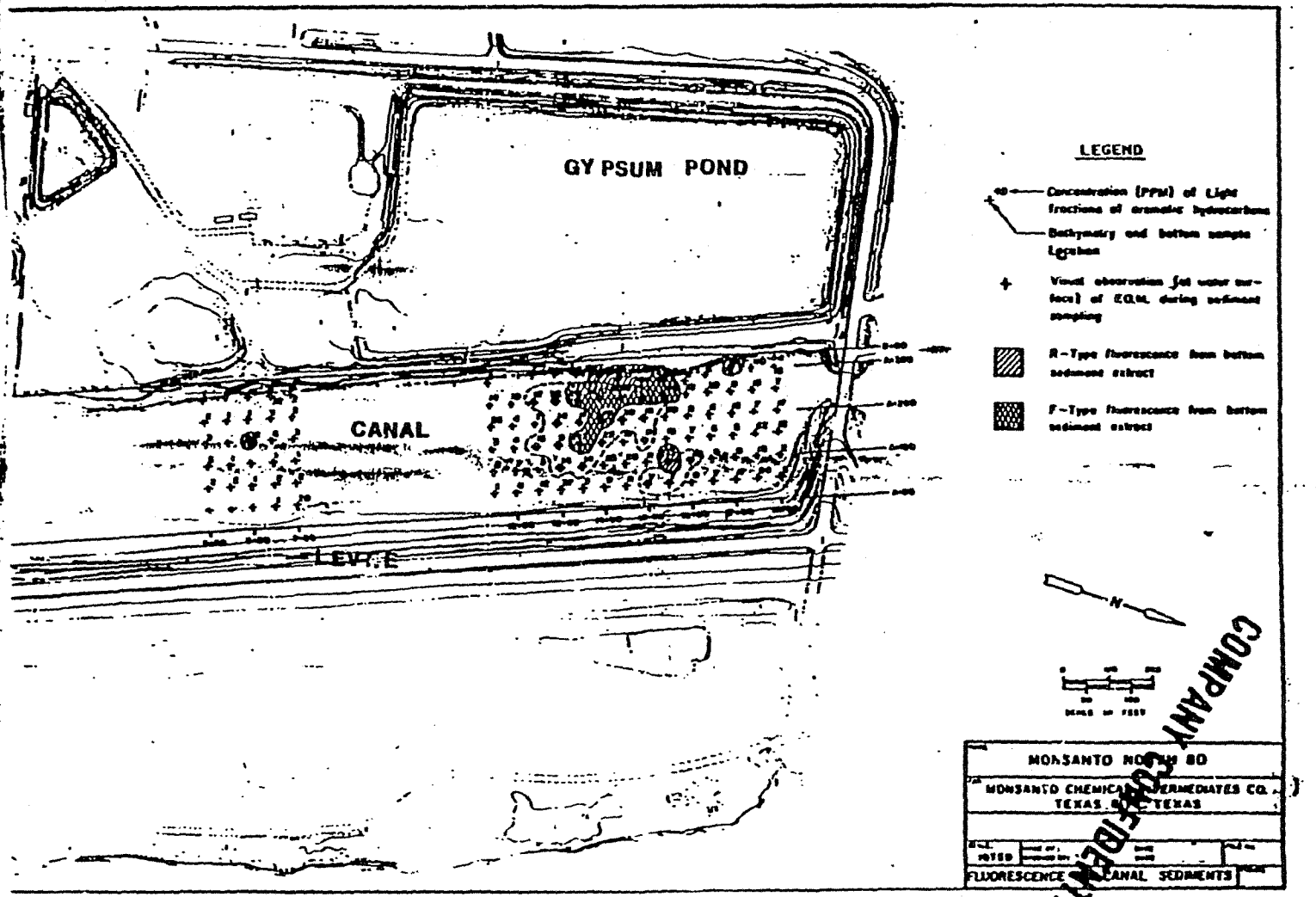

FIG 4

MCO 9327600

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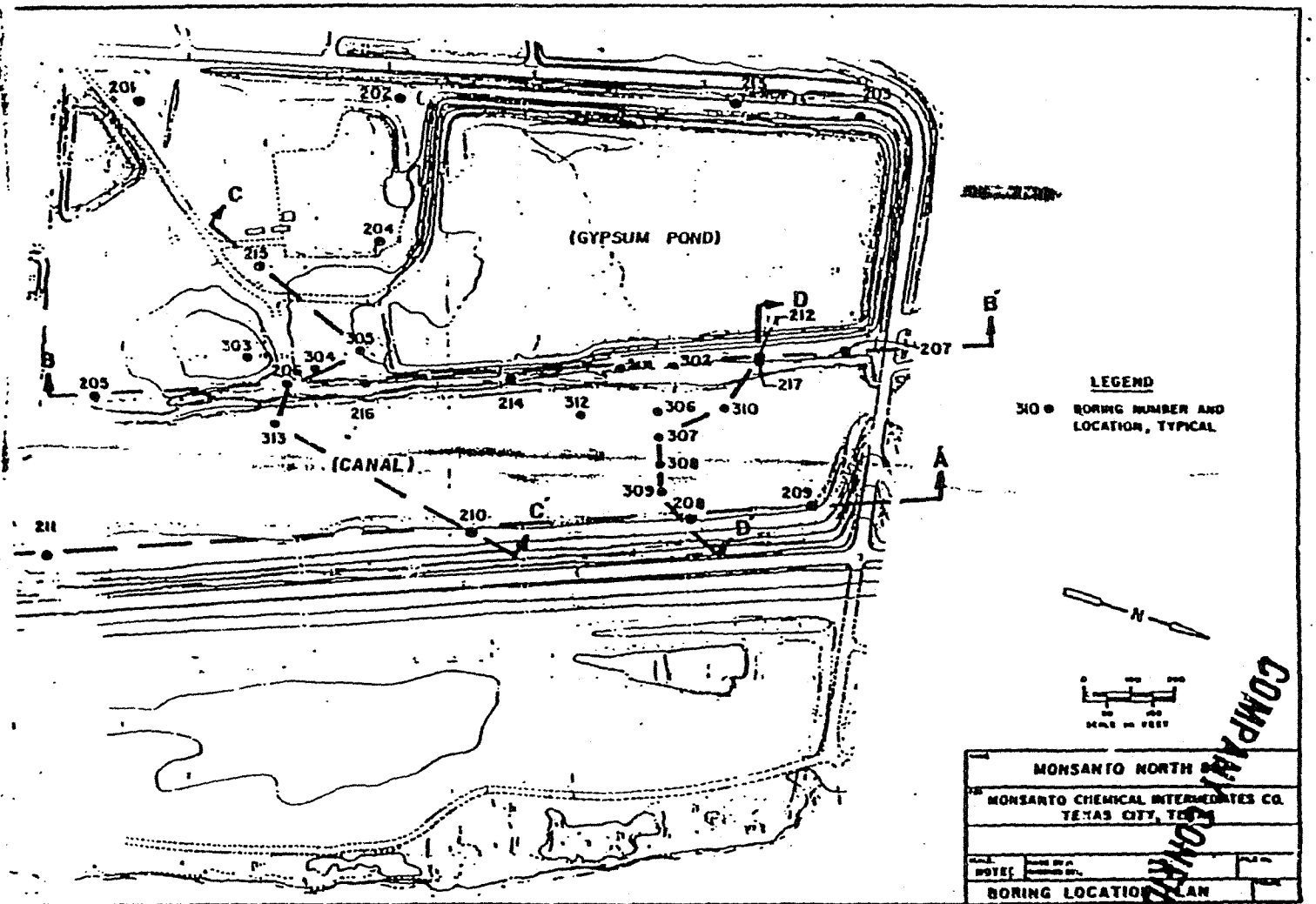

FIG 5

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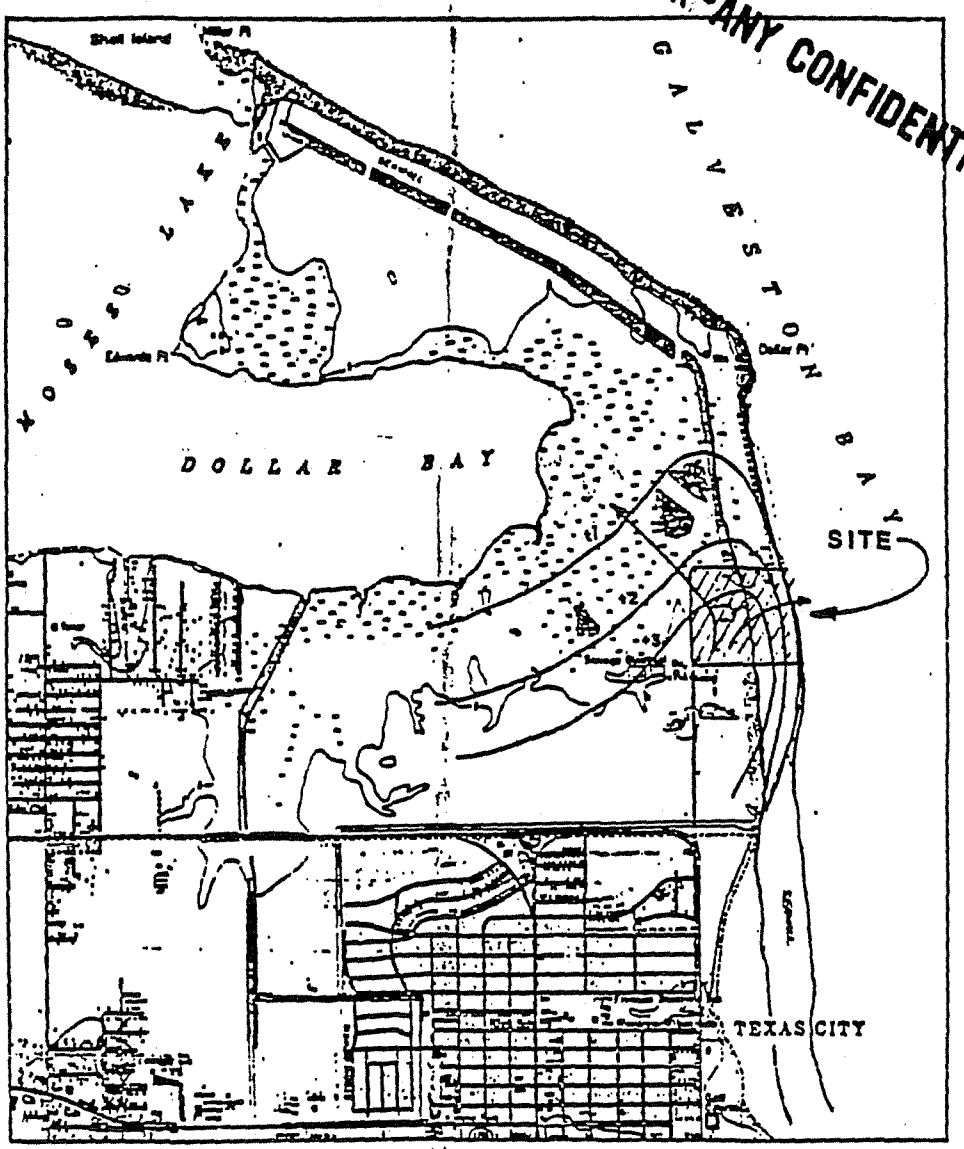

CONCEPTUAL GROUNDWATER LEVELS AND FLOW DIRECTIONS, PRIOR TO STORMWATER CANAL

FIG 6

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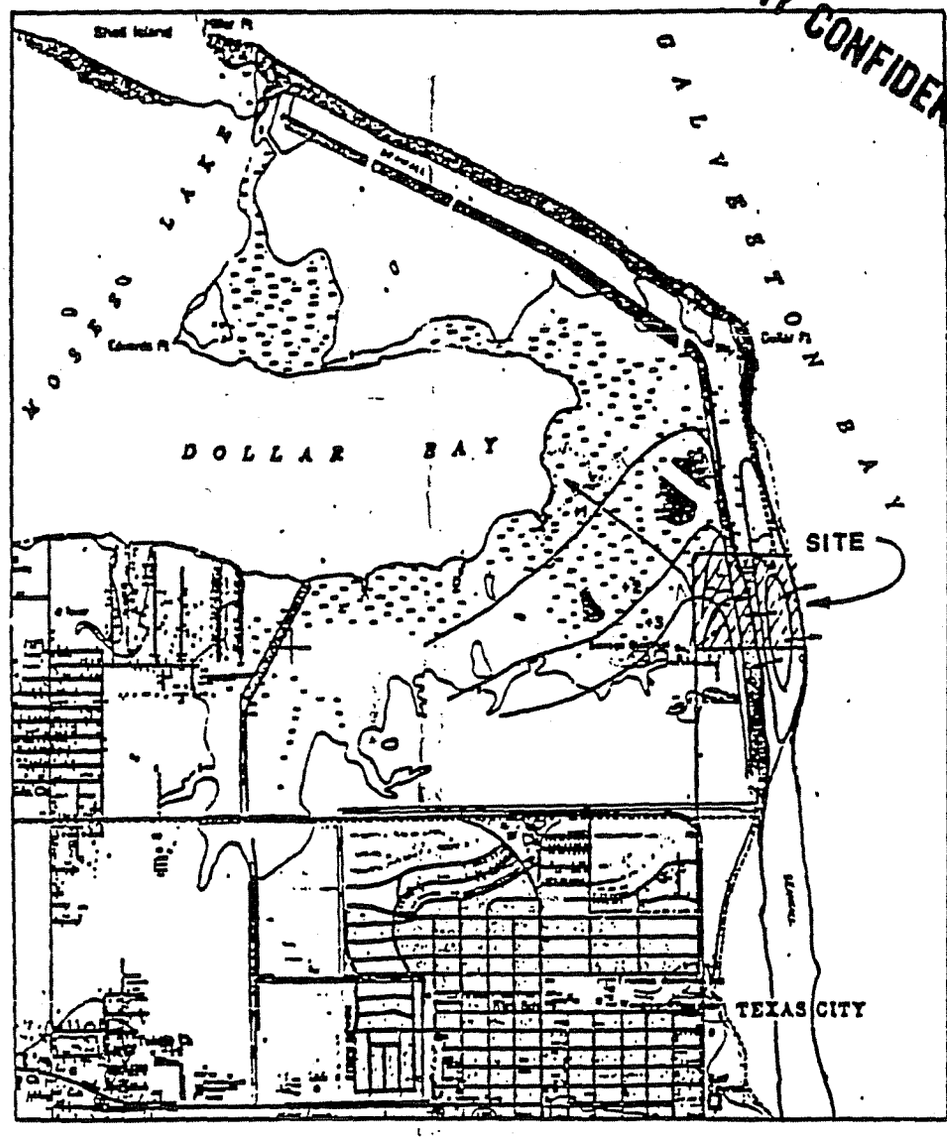

CONCEPTUAL WATER TABLE CONTOURS AND GROUNDWATER FLOW DIRECTIONS AS INFLUENCED BY THE STORMWATER CANAL

FIG 7

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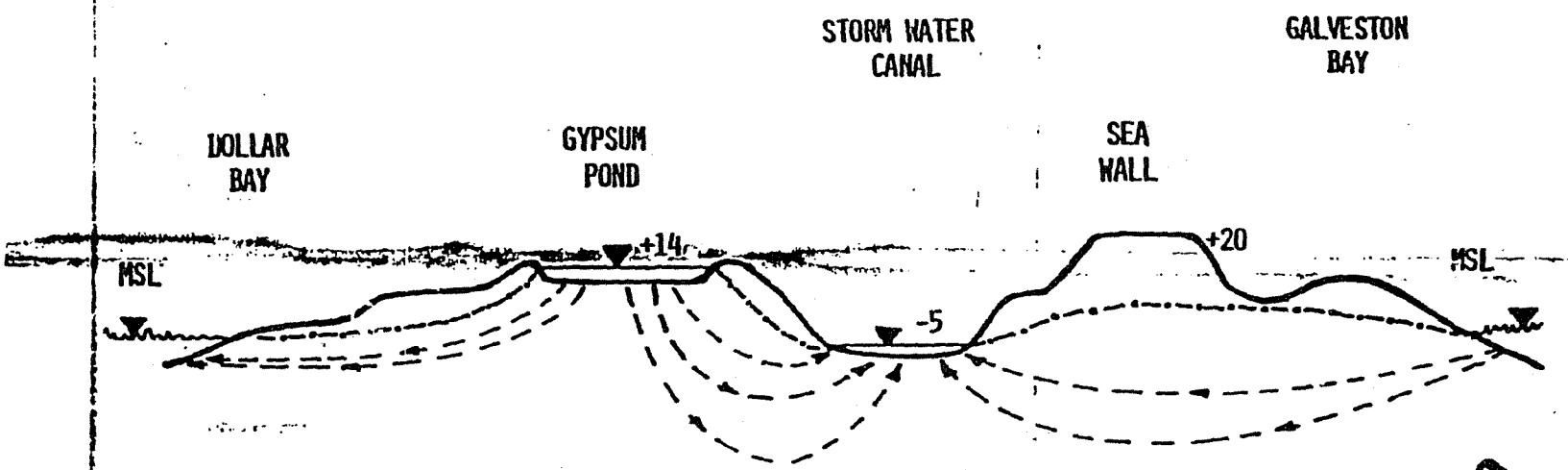

CONCEPTUAL SITE CROSS-SECTION
TEXAS CITY N-80

FIG 8

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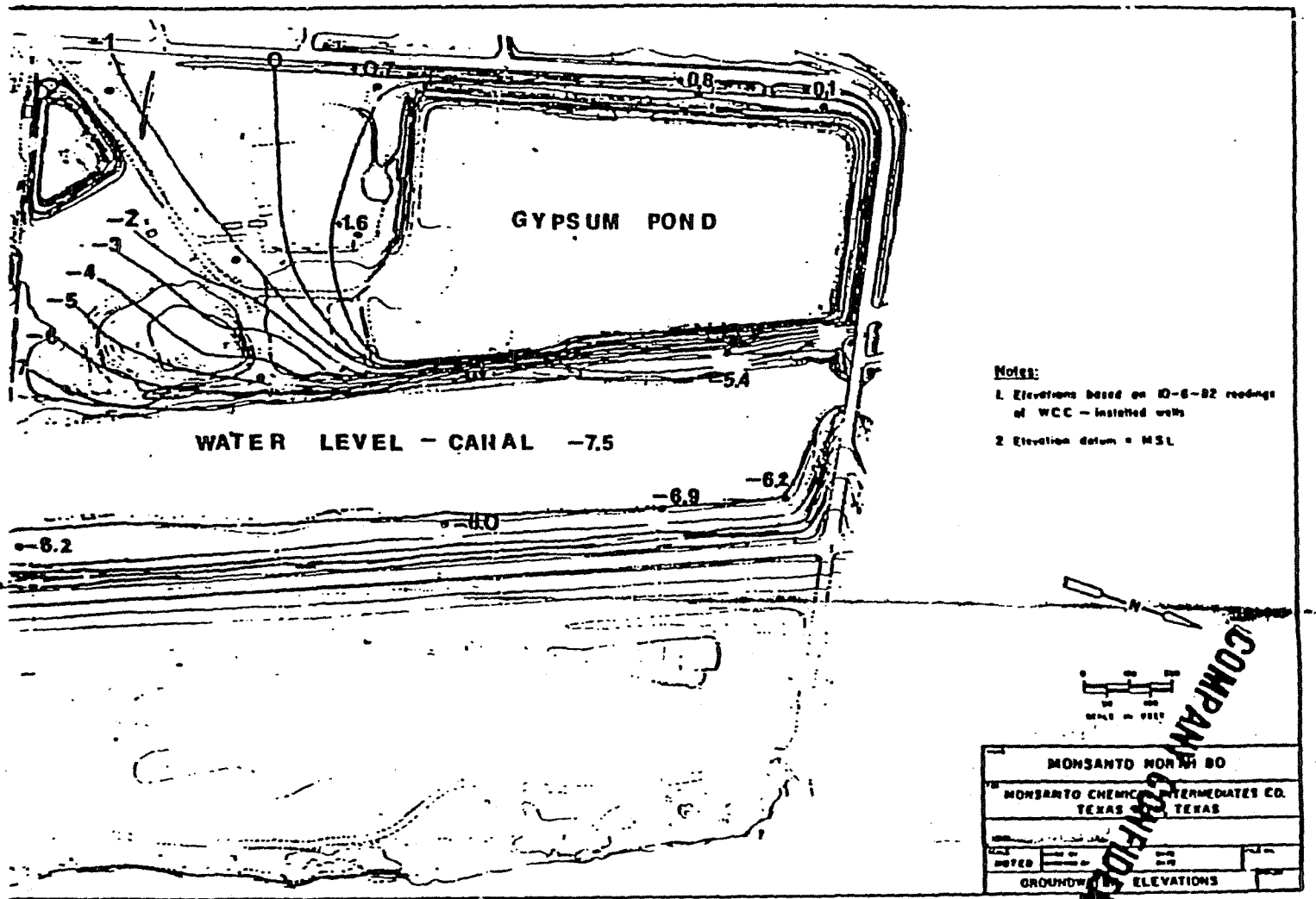

FIG 9

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