

INSTALLATION ASSESSMENT
OF
PHOSPHATE DEVELOPMENT WORKS, AL

REPORT NO. 177

CONCUR:

(b)(6)

Commander's Representative

b(6)

APPROVED:

(b)(6)

Colonel, CmTC
Commanding
US Army Toxic and Hazardous
Materials Agency

b(6)

5. The onsite phase of the records review was conducted from 28 Apr through 1 May 1980. The following personnel were assigned to the Team and prepared the report:

- a. (b)(6), Team Leader, Chemical Engineer (CSL).
- b. (b)(6), Assistant Team Leader, Chemist (CSL).
- c. (b)(6), Geologist (WES).
- d. (b)(6), Ordnance Specialist (CSL).
- e. (b)(6), Chemical Engineer (CSL).
- f. (b)(6), Ordnance Specialist (CSL).

6. In addition to the review of the records, interviews were conducted with TVA caretaker personnel and former PDW employees. A ground tour of the site was made; photographs taken during the tour are included as appendix A.

7. The findings are based on the records made available at the time of the search and are current as of 1 May 1980. Where conspicuous discrepancies existed, attempts were made to determine the correct information by interviewing personnel (if available) involved in preparing the original data.

D. Installation History^{1,2}

In August 1950, the Under Secretary of the Army approved the request of the Chief Chemical Officer to negotiate a contract for the design of the chemical plant at the Tennessee Valley Authority's Wilson Dam Reservation, Colbert County, Ala., to manufacture a chemical intermediate (dichloro) (figure 1).

Contractual action was initiated in November 1950 with the Kellex Corporation (later Vitro Corporation) as the prime contractor. A Memorandum of Agreement (MOA) between the Department of the Army and the Tennessee Valley Authority made 25.5 hectares (ha) of land available to the Army and provided the basic guidelines which were to be followed in maintenance and operation of the PDW installation after its acceptance by the using agency (U.S. Army Chemical Corps).

On 25 Jan 1951, an MOA on the installation was signed by the General Manager of TVA, the Chief Chemical Officer, and the Corps of Engineers. This agreement defined the duties of the participating agencies.

Also, in January 1951, the Government negotiated other contracts, with the Monsanto Chemical Company of St. Louis as prime contractor and the

*northwest corner
of Alabama*

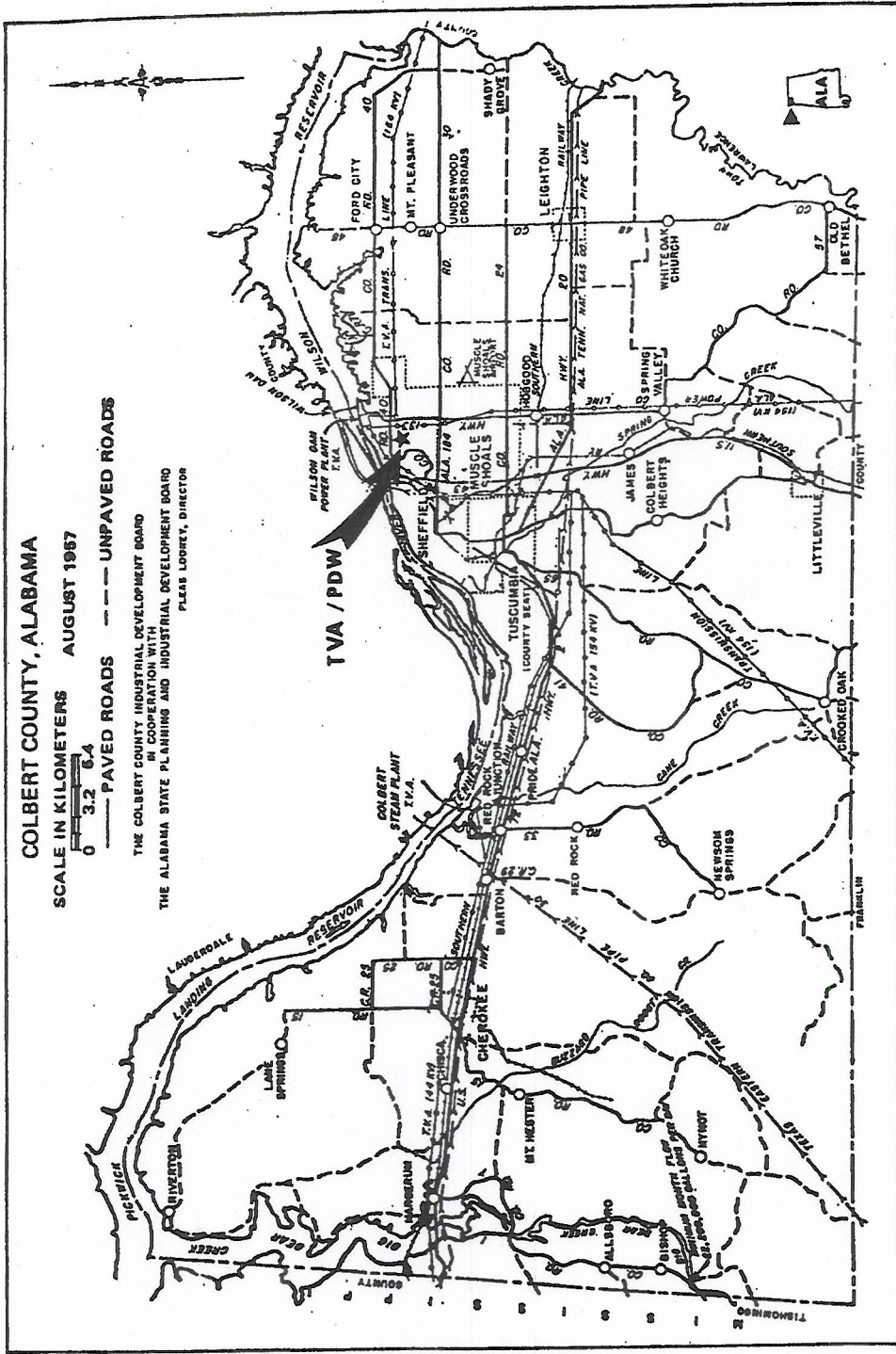


Figure 1. Site Map of U.S. Army Phosphate Development Works

Leonard Construction Company of Chicago as subcontractor, to build a chlorine plant adjacent to the installation to furnish this process chemical to PDW.

Actual construction of both the installation and the chlorine plant started in the spring of 1951 and was completed in September 1953.

DA General Order No. 1, 6 Jan 1953, established PDW as a Class II Industrial Installation. Production of a token quantity of dichloro was achieved during the fourth quarter FY 1953, and this quantity, comprising a partial tank car loading of 30 tons, was shipped on 31 July 1953.

Considerable difficulty was experienced in putting the PDW installation into successful operation, so that by December 1953, PDW was 2 years behind the original projected date for production.

Because of the extremely high priority placed on the overall agent GB program during the Korean action, design and construction were necessarily conducted concurrently. In effect, the installation was constructed as a pilot plant of gigantic size with all the problems attendant to an undertaking of its complexity.

During the period 1 Sept 1953 through 30 June 1957, a modification program was executed by joint Chemical Corps/TVA efforts; problems were resolved, and the PDW installation was brought to a capability of more than double the originally designed rate. Thus, the national requirement for dichloro was satisfied, with production terminating in the summer of 1957.

The requirement for dichloro having been met, layaway of the PDW installation was initiated 1 Sept 1957 and was completed 1 Dec 1958. During the period 1 Dec 1958 through 1 Oct 1962, PDW was maintained in a standby status.

The chlorine plant adjacent to PDW was sold to the Diamond Alkali Company (now Diamond Shamrock) in 1955. The Diamond Alkali Company continued the supply of chlorine to PDW, under contract, during the entire production period and to date continues ownership and operation for commercial production.

In anticipation of future dichloro requirements which would necessitate the reactivation of the installation, the Chemical Corps had directed considerable effort toward developing improved processes for the production of dichloro. From the choices available, it was decided to adopt the High Temperature Methanation - phosphorus trichloride (HTM-Pyro) process, the only process uniquely adaptable to PDW. The necessary project request was prepared and was officially approved 20 June 1962. OCE Directive No. 1, Job No. Muscle Shoals-PDW-62-PEMA-CHEM, 27 July 1962, made funds available for the rehabilitation of one train of the two-train installation and modifications required by the changed process. An agreement, dated 2 Oct 1962, was established between U.S. Army Engineer District, Mobile, Corps of Engineers, and TVA for

the accomplishment of the work. The agreement was terminated upon completion of the modification project (31 May 1964).

During the rehabilitation and modification, three new facilities for conversion from the dimethyl hydrogen phosphite (DMHP) process to the HTM-Pyro process were constructed and PDW was returned to a standby condition. Since there was no requirement at that time for dichloro, it was decided for economic reasons to abandon the original plan to conduct trial operations. The process modifications remain untried and untested.

The PDW installation now falls under the auspices of ARRCOM, with the Contracting Officer's Representative located at Volunteer Army Ammunition Plant and TVA providing caretaker service on a reimbursable basis.

E. Environmental Setting

1. Meteorological Data

The climate of Colbert County is characterized as warm-temperate, typical of the Gulf states. The average growing season is 230 days, from March (last spring frost) to November (first killing frost). The climatic information in table 1 was provided by TVA based on U.S. Weather Bureau data current as of 1979. (This information is in the English system: degrees F, and inches.) Appendix B provides climatological data utilized by TVA in its Environmental Impact Statements.

2. Biota*

According to TVA environmentalists there are no rare, endangered, or protected species unique to the National Fertilizer Development Center (NFDC) or PDW.

The operational area of PDW is essentially devoid of arboreal growth.

The NFDC agricultural group is currently using the northern clay-lined lagoon as a stocking pond. The lagoon is stocked with Chinese and bullhead carp. These carp, which are not indigenous to the Tennessee River, are being used in biomass recycle experiments at NFDC (not on the PDW installation site).

*Appendix C contains additional information on biota of PDW.

b. In 1953, a leak developed in the process heating system resulting in the leak of Dowtherm A heat transfer medium (a biphenyl-biphenyl oxide mixture). This occurred prior to the installation of the waste lagoons; the material flowed through the surface drainage system into Pond Creek and the Tennessee River. A Dowtherm A leak reoccurred in the spring of 1954. This leak was controlled without any spillover into the newly installed lagoons.

c. In 1953, an explosion occurred in the DMHP reaction system (building 101). The incident resulted in five fatalities. An investigation was conducted to determine the cause (report on file in the vault in building 810). The conclusion of the study was that a runaway reaction was the causal factor.

d. In 1953, a glass lined reactor failed in the Pyro Chlorinator System (building 301, Dichloro Production Facility), dumping approximately 1,000 liters of Pyro mix into the Chemical Sewer.

e. In recent years, TVA has been using elements of the PDW tank farm for storage (with Army approval). In 1975, two tanks containing No. 2 fuel oil developed leaks (attributed to freezing of condensate in the lines). The tanks dumped approximately 10,000 l of oil which escaped through cracks in the concrete dike and accumulated in the South Lagoon. A private contractor was hired to reclaim the oil.

f. Pyro starter mix is stored in 55-gallon stainless steel drums in building 301. This material is being held as feed stock for mobilization. During the site tour, it was noted that one drum is leaking.

g. The dichloro production processes involved highly corrosive materials. As a result, during operations, leaks were a common occurrence, frequently at the expansion joints which were most vulnerable.

C. Water Quality

1. Surface

There are no natural surface streams or ponds within the boundaries of PDW.

2. Subsurface

The only subsurface water analyses available in the immediate vicinity of PDW were for three shallow wells located within NFDC near the TVA Phosphorus Waste Lagoon. Results are included in table 5. Additional water analyses of wells and springs outside the immediate vicinity of PDW in Colbert County are included in appendix I.

3. NPDES Permits

PDW has no NPDES permits.