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REMOVAL SITE EVALUATION FOR THE PILOT PLANT DRAINAGE DITCH - FEBRUARY 17, 1995

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Removal Site Evaluation for the Pilot Plant Drainage Ditch

Fernald Environmental Management Project
United States Department of Energy

February 17, 1995

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Removal Site Evaluation
Pilot Plant Drainage Ditch

The pilot plant drainage ditch (PPDD) originates just west of the pilot plant and flows into Paddys Run immediately south of the K-65 silos. Surface water in the PPDD has been contaminated by uranium since at least 1962, when sampling results showed uranium concentrations in the range of 7 to 28 parts per million. (See Figure 1 for location of the PPDD.) Actions taken to block what was considered the primary source of uranium contamination to the PPDD have not been completely successful; contaminated surface water continues to flow into the PPDD and Paddys Run. In fact, data collected for the Operable Unit 5 (OU5) Remedial Investigation show that uranium concentrations near the headwaters of the PPDD are four times the surface water preliminary remediation level (PRL) set forth in the OU5 preferred remedial alternative as defined in the OU5 draft Proposed Plan (November 1994).

The purpose of this removal site evaluation (RSE) is to:

- briefly review the steps taken to control contamination in the PPDD
- review available data
- identify the probable source of contamination in the PPDD
- present general information on the potential risk to human health and the environment relative to the PRLs and ecological benchmark criteria
- assess contaminant pathways to the public and the environment
- assess the need for a removal action
- present appropriate response actions.

This RSE is supported by the OU5 RI Report, which provides the most comprehensive discussion on the nature and extent of surface water, sediment, and soil contamination associated with the PPDD.

Introduction

Historically, storm water runoff and subsurface drainages from the area around the pilot plant have flowed into catch basin (CB)-131 (Figures 1 and 2). When the FEMP first began operating, the runoff and drainages from CB-131 were discharged through a 12-inch underground storm sewer line into the PPDD. It is assumed this was done because the topography would not allow gravity flow to the storm sewer system, which discharged to the storm sewer outfall ditch.

As it became known in the early 1960s that the surface water collected in CB-131 had levels of uranium above acceptable discharge criteria, the pilot plant warehouse sump (PPWS) was installed to pump the collected water to the general sump for treatment. The underground storm sewer line then served as an overflow line for those occasions when the PPWS did not operate or the runoff

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from a large storm exceeded the pumping capacity of the PPWS. (Figure 3 is a profile of the PPWS and the underground storm sewer line.)

During the following years, contaminated water intended to be pumped to the general sump instead flowed into the PPDD when the pump was not operating properly. This was confirmed through data collected from the PPDD during the 1988 Best Management Practices Sampling Program. Because problems with the pump persisted, in 1989 the underground storm sewer line was plugged at the effluent side of the PPWS to stop the discharge into the PPDD. However, sampling data continued to show elevated concentrations of uranium in the PPDD, and a work order was placed in 1991 to repair or replace the pump. It was suspected that water accumulating in the sump and in the saturated ground surrounding the sump continued to seep around the plug in the 12-inch storm sewer line or flow directly into the storm sewer line downstream of the plug. Higher-priority work delayed implementation of the work order. Once work began, it was determined that the pump could not be repaired as first thought. A new pump was ordered, and additional delays were incurred waiting for delivery of the pump. The new pump was installed, and the PPWS resumed operations in late 1994.

Source Term Information

Consistent with 40 CFR 300.410 (a), this RSE includes a removal preliminary assessment based on readily available information as described in 40 CFR 300.410 (c).

Sufficient sampling data are available to make this assessment. Environmental Monitoring (EM) has been collecting surface water samples from the PPDD on a weekly schedule since January 1991. In addition, OU5 collected samples in 1993 as part of its remedial investigation. Nearly all these samples had uranium concentrations well above background levels. Uranium concentrations at the EM location (W-10 DD in Figures 1 and 2) average about 600 parts per billion (ppb), with a maximum concentration of more than 2700 ppb. The OU5 sampling data showed a maximum uranium concentration of 2890 ppb at the headwaters of the PPDD.

Sediment samples were not collected from the PPDD during the 1993 RI field program; however, sediment samples collected in 1988 for the RI and during the Characterization Investigation Study in the mid-1980s did show above-background (but significantly below the sediment PRL for uranium) concentrations of uranium in the PPDD.

In addition to the overflow from the PPWS, the PPDD receives water from natural runoff, perched groundwater seeps, and flow collected from the uncontrolled runoff from the waste pit area. To determine the magnitude of the contamination from these alternate sources, in 1993 OU5 collected surface water samples from three locations along the ditch, from the pipe which carries storm water runoff from the uncontrolled sections of the waste pit area, from 10 perched groundwater

seeps, and from three Type 1 wells (11068, 11069, and 11070) located near the PPDD (Figures 1 and 2). These data show that:

- the perched groundwater contributes little to the overall contamination in the PPDD — *the uranium concentrations in the seeps range from 10-25 ppb*
- the uranium concentration in the uncontrolled runoff from the waste pit area is somewhat higher (110 ppb), but contributes relatively little to uranium contamination in the PPDD
- uranium concentrations in perched groundwater (the Type 1 wells) are 3.8, 9.2, and 26.7 ppb, which are in the same range as the uranium concentrations in the seeps and well below uranium levels in the surface water
- uranium concentrations in PPDD surface water decrease as the distance from CB-131 increases (2890 ppb at PP-DD-04 to 950 ppb at PP-DD-01 and 850 ppb at EM W-10 DD, respectively).

These results confirm that perched groundwater, groundwater seeps, the uncontrolled runoff from the waste pit area, and natural runoff are relatively minor sources of uranium contamination in the PPDD, and that the primary source of uranium contamination in the PPDD is most likely the surface water runoff and subsurface drainages which collect in CB-131 and the PPWS.

The data show that uranium concentrations in the surface water of the PPDD exceed free release criteria specified in DOE Order 5400.5. This is discussed in more detail in the section *Evaluating the Magnitude of the Potential Threat*. The data also indicate that nonradiological contaminant levels are not significantly above background levels. A complete discussion of this data is presented in the OU5 RI Report.

Measuring Surface Water Flow in the PPDD

Because documentation for flow-rate estimates in the PPDD did not exist, OU5 sampling technicians collected flow data from two locations during the June/July 1993 field programs. (See Figures 1 and 2 for weir locations.) The upstream weir was installed just below the convergence of the north, middle, and south forks; the downstream weir was installed just upstream of the surface water sampling location PP-DD-01. During the two-month collection period, only the middle fork contained water. Technicians collected 20 measurements from both weirs.

- Upstream Weir
  - Average flow = 16.3 gpm
  - Minimum flow = 7.2 gpm
  - Maximum flow = 37.4 gpm
- Downstream Weir
  - Average flow = 20.7 gpm
  - Minimum flow = 9.4 gpm
  - Maximum flow = 50.5 gpm

These data show that flow at the downstream weir is greater than at the upstream weir. The only conclusion that can be drawn from these data is that uncontrolled surface water runoff, ground-

water seeps, and the flow from the waste pit area drainage pipe contribute to the flow in the PPDD. No correlation between rainfall and contaminant concentrations can be made at this time.

Assessing Potential Pathways

Although uranium contamination levels are high near the headwaters of the PPDD, the pathways to receptors are somewhat limited. Ecological receptors could drink the water in the PPDD or come into contact with contaminated sediment or soil. As shown in Figures 1 and 2, the area around the headwaters of the PPDD (the section with the highest uranium concentrations) is fenced and not readily accessible. As the surface water in the PPDD flows toward Paddys Run, uranium concentrations decrease and approach the PRL for uranium. Because sections of Paddys Run's stream bed is sand and gravel and the water table in the aquifer is below the stream bed, it is possible that contaminated surface water originating in the PPDD could migrate through the stream bed into the aquifer and impact groundwater quality.

Evaluating the Magnitude of the Potential Threat

As noted previously, the OU5 RI provides a comprehensive discussion on the nature and extent of contamination. A complete list of surface water and sediment samples and results (radiological and nonradiological) is provided in Appendix G of the OU5 RI. The RI determined that uranium is the primary contaminant of concern in the PPDD. Therefore, for this RSE, uranium data are used to evaluate the magnitude of the potential threat associated with the PPDD.

Sampling data for uranium are compared to applicable regulatory requirements and criteria to provide a qualitative assessment of potential hazards associated with surface water in the PPDD. The potential impact from ingesting surface water can be evaluated by comparing the uranium concentrations detected in the samples to the derived concentration guides found in DOE Order 5400.5, *Radiation Protection of the Public*. Also included for comparison in the following table is the PRL for uranium.

DCG for Natural Uranium Ingested Water	PRL for Total Uranium Surface Water	Sampling Location PP-DD-04	Sampling Location PP-DD-03	Sampling Location PP-DD-01	Sampling Location W-10 DD
6×10^{-7} μCi/mL					
600 pCi/L	358 pCi/L	1952 pCi/L	1250 pCi/L	642 pCi/L	574 pCi/L
888 ppb	530 ppb	2890 ppb	1850 ppb	950 ppb	850 ppb

The comparison shows that the uranium concentration in the samples collected for the OU5 RI are above the DCG for natural uranium; the 95% UCL on the median for the 1993 EM data at W-10 DD is approximately the same as the DCG.

Assessing Relative Risk

As part of the OU5 Feasibility Study, data are compared to PRLs to determine the need for remediation in specific areas. A comparison of the surface water PRL for total uranium with the OU5 RI data show that the total uranium concentration in the headwaters of the PPDD is about four times its PRL of 530 ppb. The data collected at PP-DD-01, however, is about 1.8 times the PRL; this is supported by EM data collected at W-10 DD.

In order to protect the underlying Great Miami Aquifer, it is prudent to eliminate the flow of contaminated water from the PPWS through the underground storm sewer line and into the PPDD. Once the flow is intercepted, uranium contamination levels will likely decrease to below the PRLs at all sampling locations along the PPDD. Cleanup of the PPDD can then proceed as part of the long-term remediation plans for OU5.

OU5 also conducted the Site-wide Ecological Risk Assessment and presented the results in the OU5 RI Report. The assessment states that ecological receptors in Study Area F (where the PPDD is located) are not at risk from exposure to radiological contaminants. This includes the scenario where ecological receptors use the PPDD as a source of drinking water.

Assessing the Need for a Removal Action

Consistent with Section 40 of the Code of Federal Regulations (CFR), Part 300.410 of the National Contingency Plan, the DOE has evaluated whether a removal action to control the flow of contaminated surface water to the PPDD is appropriate. Of the eight factors listed in this reference, the following four factors could apply to potential radioactive contamination in the construction wastes:

- ***40 CFR 300.415 (b) (2) (i)***: Actual or potential exposure to nearby human populations, animals, or the food chain from hazardous substances or pollutants or contaminants.
- ***40 CFR 300.415 (b) (2) (iii)***: Actual or potential contamination of drinking water supplies or sensitive ecosystems.
- ***40 CFR 300.415 (b) (2) (iv)***: High levels of hazardous substances or pollutants or contaminants in soils largely at or near the surface that may migrate.
- ***40 CFR 300.415 (b) (2) (v)***: Weather conditions that may cause hazardous substances or pollutants or contaminants to migrate or be released.

The contamination in the PPDD is compared to these factors. Although the uranium concentrations in the ditch are above the DCG and the PRL, they are not high enough to warrant a removal action

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being implemented. Appropriate engineering controls will be in place during the response actions to ensure that there will be minimal potential for release of hazardous substances.

Appropriate Response

Based on an evaluation of the data relative to the DCG and the PRL, DOE recommends a Best Management Practices action be implemented in support of the CERCLA remediation to prevent additional contaminated water in the PPWS from reaching the PPDD.

The Pilot Plant Drainage Ditch project will collect the contaminated effluent currently being discharged from the end of the 12-inch underground storm sewer line in a new, small prefabricated sump. Figures 4 and 5 show the conceptual layout of the BMP action. The water which is collected in the proposed sump will be treated in the Advanced Wastewater Treatment facility (AWWT). During engineering design, options for directing the water to the AWWT will be evaluated. As shown in Figure 5, one option would be to pump the water through new piping to an existing storm sewer which leads to manhole-79 and the storm water retention basin (SWRB). From the SWRB, the water will be pumped to the AWWT.

Soil will be excavated in order to install the sump. As part of a separate activity, the existing line from the PPWS to the general sump will be diverted and connected to a separate line which leads to tank 155 prior to treatment in the AWWT. The diversion line will be above ground due to the planned demolition of the pilot plant. No soil excavation is planned for this part of the project.

The new sump will be installed in an area designated as a wetland. A pre-discharge notification is being provided to the U.S. Army Corps of Engineers to inform them that approximately 0.1 acres of emergent wetlands will be dredged and filled for this project. Based upon DOE's review of the U.S. Army Corps of Engineers' Nationwide Permits promulgated in Appendix A to 33 CFR Part 330, DOE has determined that the proposed project meets the terms and conditions specified for Nationwide Permit 26 - Headwaters and Isolated Water Discharges. Construction of the sump will result in the excavation of approximately 14 cubic yards of material within the wetland area. In addition, approximately 0.1 acres of wetlands will be graded/grubbed to prepare the site for construction.

Based on past investigations of the area and on conversations with the State Historic Preservation Office, the Ohio Department of Natural Resources, and the U.S. Fish and Wildlife Service, DOE has determined that the proposed project will not impact any historical sites or threatened and endangered species habitat.

The waste from this project will be controlled by Site Standard Operating Procedure SSOP-0044, *Improved Storage of Soil, Debris, and Waste from a Project* and the approved work plan for Removal Action 17, *Improved Storage of Soil and Debris*. All wastes from this project will be monitored for radioactivity prior to final disposition. Among the controls which will be implemented

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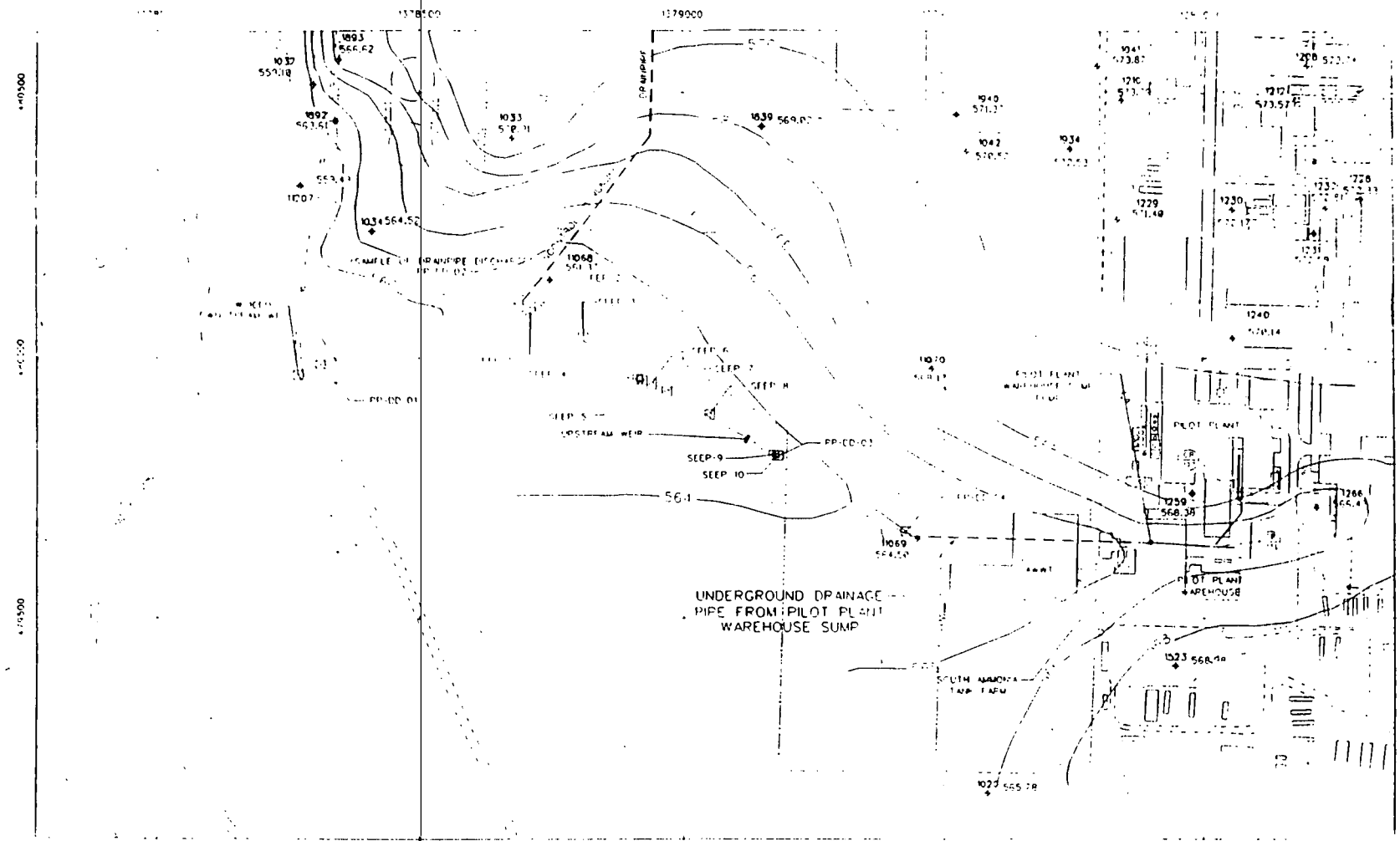
during the BMP action are:

- follow Project Specific Health and Safety Plan
- position physical barriers around the work area to prevent unauthorized access
- provide protective clothing and respiratory protection for workers, as required
- use tarpaulins for lay-down.

OU5 is arranging for a radiation survey of the area near where the proposed sump will be installed. If the survey determines the sediment or surrounding soil is contaminated, appropriate measures consistent with the FEMP Health and Safety Plan will be taken, including roping off the contaminated area. The uranium-contaminated sediment or soil would then be removed to levels consistent with detection limits of hand-held instrumentation.

Air monitoring will also be conducted during the BMP action to determine if contaminants are being released into the environment. In this way, actions can be modified quickly to minimize the potential spread of contamination.

This project does not address long-term remediation requirements, but is consistent with the goal of protecting human health and the environment. Any contamination along the length of the PPDD will ultimately be remediated in accordance with the Record of Decision for OU5.



LEGEND:

- PERCHED WATER ELEVATION CONTOURS
- TYPE 1 WELLS
- SEEPS
- SURFACE WATER
- CATCH BASIN

SCALE

200 100 0 200 FEET

FIGURE 2. PILOT PLANT DRAINAGE DITCH SAMPLE LOCATIONS AND WATER TABLE

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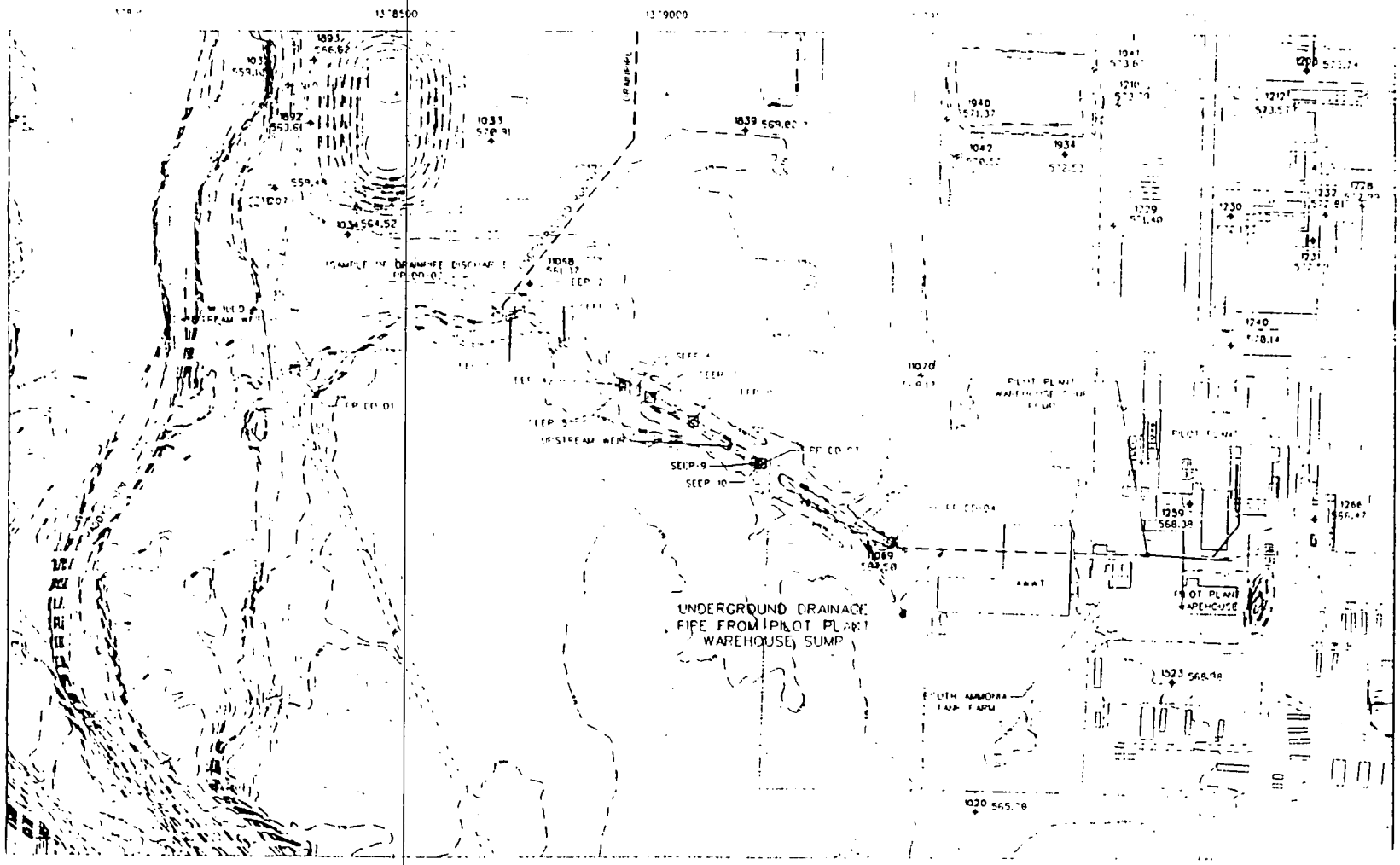

FIGURE 1. PILOT PLANT DRAINAGE DITCH SAMPLE LOCATIONS AND SURFACE WATER

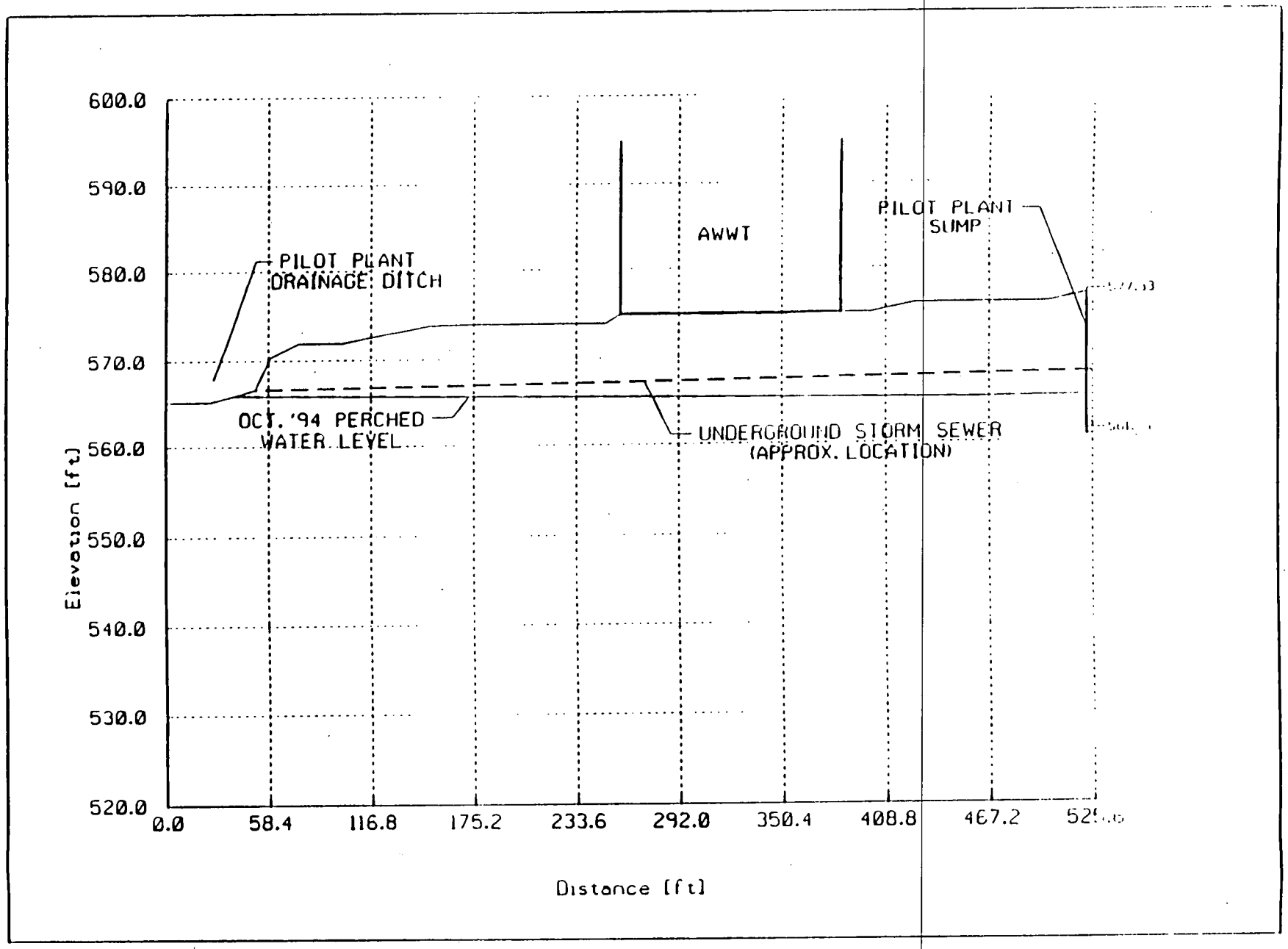

FIGURE 3. UNDERGROUND STORM SEWER LINE PROFILE

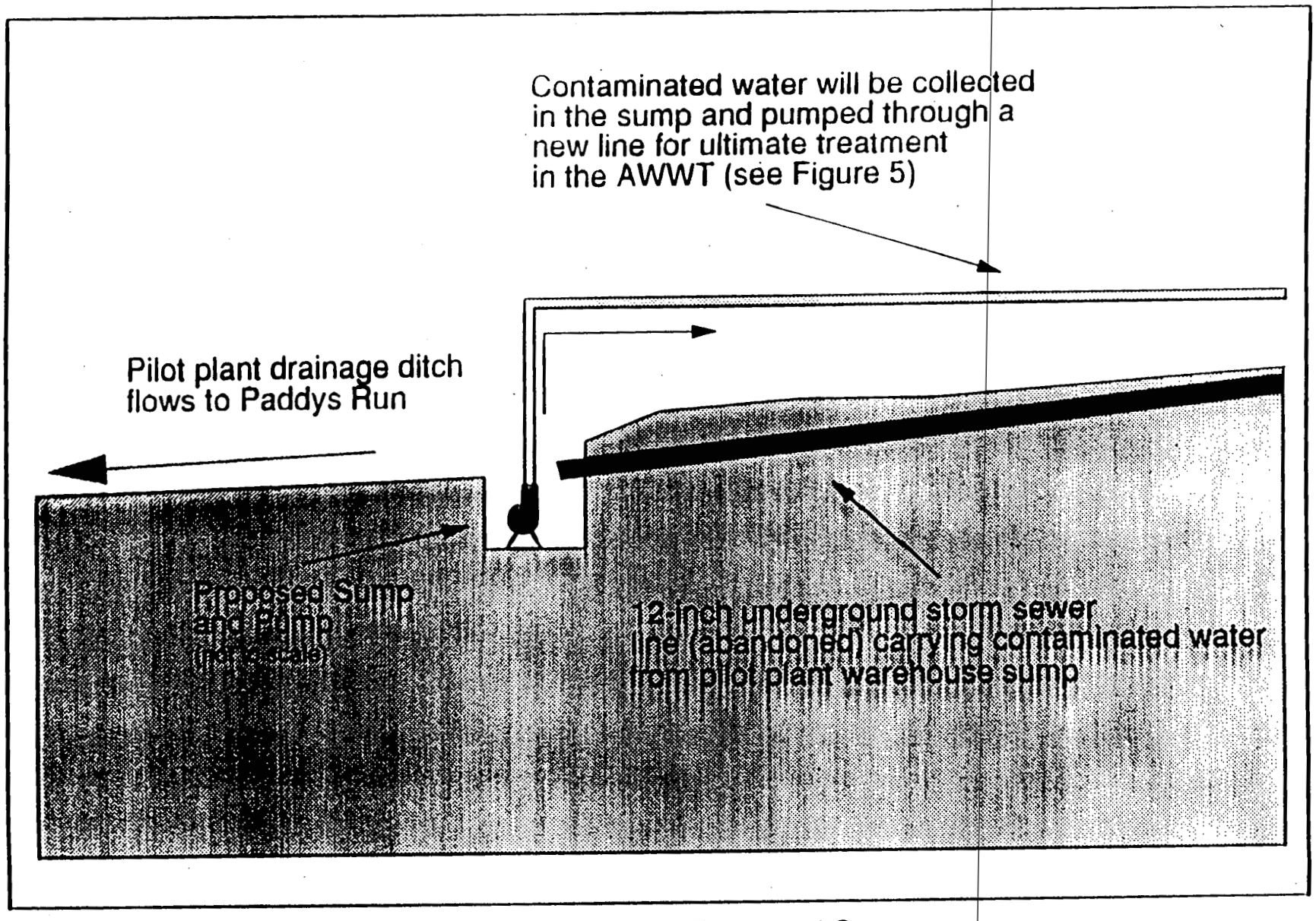

Figure 4: Schematic of Proposed Sump

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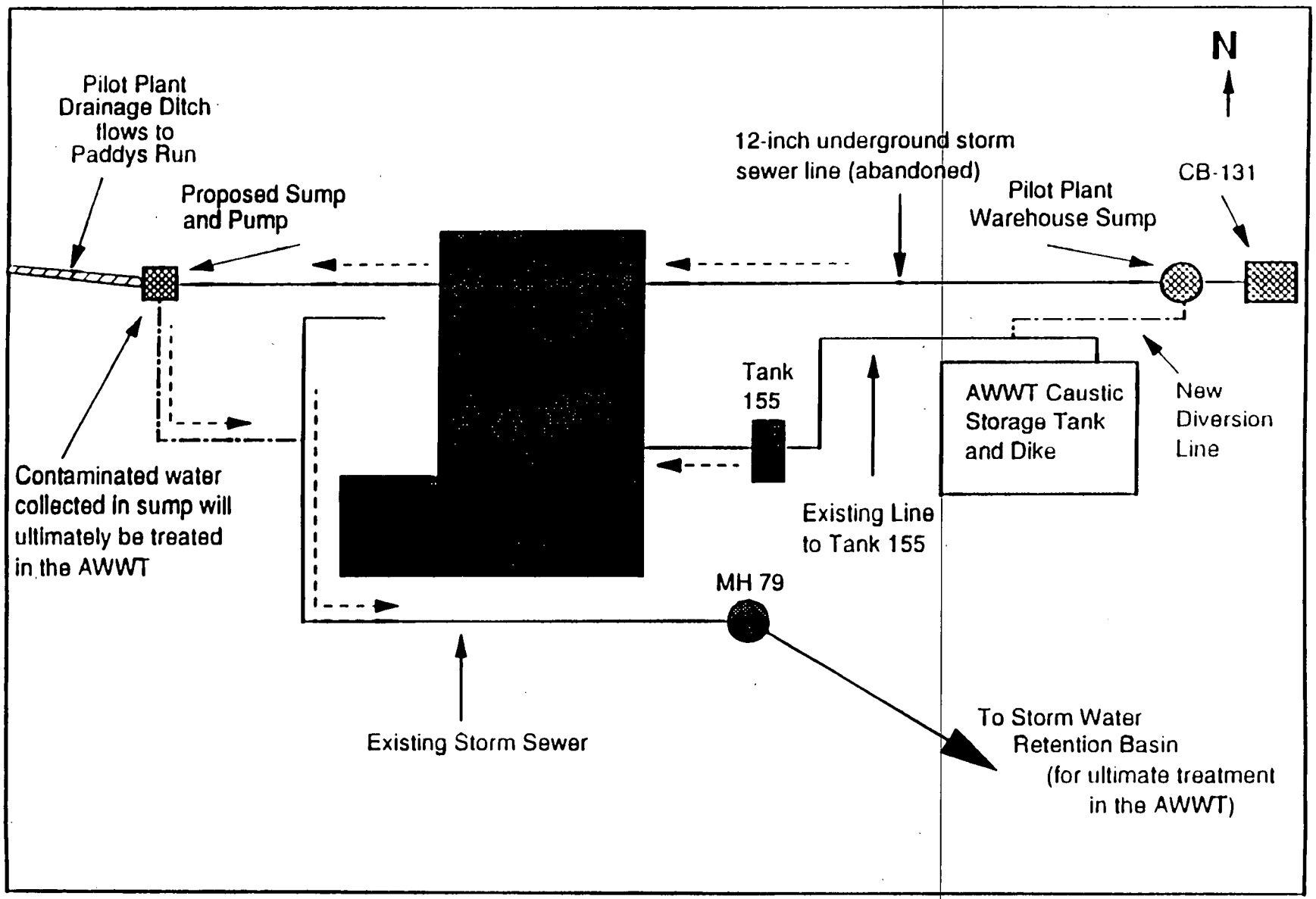

Figure 5: Conceptual Layout of the Best Management Practices Action

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