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COMPREHENSIVE STRATEGY FOR CORRECTIVE ACTIONS AT THE SAVANNAH RIVER SITE GENERAL SEPARATIONS AREA (U)

by

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ABSTRACT

The Savannah River Site (SRS), operated by the Westinghouse Savannah River Company for the United States Department of Energy, contains a number of waste disposal units that are currently in various stages of corrective action investigations, closures, and postclosure corrective actions. Many of these sites are located within a 40-square-kilometer area called the General Separations Area (GSA). The SRS has proposed to the regulatory agencies, the United States Environmental Protection Agency (EPA) and the South Carolina Department of Health and Environmental Control (SCDHEC), that groundwater investigations and corrective actions in this area be conducted under a comprehensive plan. The proposed plan would address the continuous nature of the hydrogeologic regime below the GSA and the potential for multiple sources of contamination. This paper describes the proposed approach.

INTRODUCTION

The Savannah River Site (SRS) is operated by the Westinghouse Savannah River Company for the United States Department of Energy. At the geographic center of the 800-square-kilometer site, a number of waste disposal units are currently in various stages of corrective action investigations, closures, and postclosure corrective actions. Many of these sites are located within a 40-square-kilometer area called the General Separations Area (GSA) shown in Fig. 1. The SRS has proposed to the regulatory agencies, the United States Environmental Protection Agency (EPA) and the South Carolina Department of Health and Environmental Control (SCDHEC) that groundwater investigations and corrective actions in the GSA be conducted under a comprehensive plan (1). The proposed plan would address the continuous nature of the hydrogeologic regime below the GSA and the potential for multiple sources of contamination.

BACKGROUND

The GSA contains two fuel reprocessing chemical plants, a tritium processing facility, and their associated high level and low level radioactive waste handling facilities. Many of the facilities have been operated for three decades while others are of recent construction. The older waste handling facilities constitute the primary source of groundwater contamination. Fig. 2 identifies the major facilities of interest in considering groundwater corrective actions. The extensive network of monitoring well clusters that exists in the area is also shown in this figure.

Chemical and radiochemical contamination exists in the uppermost aquifer in the GSA. This aquifer contains three principal water-bearing units. The flow of water in these units is controlled by three streams bounding the GSA: Upper Three Runs to the north and northwest, McQueen Branch to the east, and Fourmile Branch to the south. The hydrogeologic regime of the GSA is such that contaminated groundwater plumes from adjacent facilities intermingle. This complicates both characterization of the individual sites and postclosure corrective actions if they are undertaken singly for each disposal unit.

The uppermost aquifer is separated from an underlying regional aquifer by a competent aquitard, known as the Ellenton clay formation. Current evidence indicates that the underlying regional aquifer is protected by the integrity of the Ellenton formation and by the existence of an upward gradient across the formation.

Six units in the GSA are being evaluated and closed under SCDHEC Hazardous Waste Management Regulations as authorized by the Resource Conservation and Recovery Act (RCRA). These are listed in Table I. Fourteen units are being investigated under both Section 3004 (u) of RCRA and the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) regulations. These units are currently in the RCRA Facility Investigation/Remedial Investigation (RFI/RI) stage. They are listed in Table II.

Closure actions are at or near completion at the three F-Area seepage basins, the four H-Area seepage basins, and the Mixed Waste Management Facility (MWMF). The seepage basins received low radioactivity, dilute sodium nitrate aqueous wastes from 1955 to 1988 via vitrified clay pipes, which are also undergoing closure. They were designed for slow seepage to allow time for radioactive decay before discharge to surface streams. The basins were operated at a pH of 2. The MWMF is part of the the Low Level Radioactive Waste Disposal (LLRWD) complex at SRS. It received wastes from 1969 to 1986. The closure of the MWMF is described in another paper being presented at this conference (2).

The basins and the MWMF received regulated materials including heavy metals - Cd, Pb, Hg - and incidental amounts of organic solvents. Groundwater monitoring data for these facilities and wetlands characterization of associated groundwater discharge areas provide evidence both of the extent of contamination and the absence of near-term risks to human health. A Corrective Action Plan has already been submitted for the basins (3,4) and one is under preparation for the MWMF, as required by settlement agreements.

DISCUSSION

The proposed plan includes provisions for characterization of the total extent of contamination in the GSA; evaluation, testing, and selection of appropriate groundwater corrective actions; and implementation of corrective actions on a regional basis. If approved the proposed plan will consolidate characterization under five major units and address postclosure corrective actions on a regional basis. Closures will continue to be handled as required by regulations or agreements.

Fig. 3 shows the potentiometric surface of the Water Table unit, Aquifer Zone IIB_2, in the GSA. The lithological characteristics and hydrographic nomenclature of the Tertiary hydrostratigraphic systems of the GSA have been described (5). It is the hydrogeologic characteristics that led SRS to propose an integrated approach to groundwater corrective actions in place of a unit-by-unit approach driven by regulations.

The assessment strategy would focus on the five major units in the area and their impact on groundwater: the F-Area Seepage basins, the H-Area Seepage basins, the LLRWD complex, the 200-F operating area, and the 200-H operating area. Characterization of the basins and the LLRWD complex is well underway. The 200-F and 200-H operating areas contain the high level radioactive waste tank farms and other RFI/RI sites. These areas are congested with buildings, equipment, operating facilities, roads, underground pipelines, overhead electrical lines, radiologically controlled areas, vehicles and personnel. The initial monitoring phase in each of these areas would consist of perimeter wells monitoring the three water-bearing units. In places where contamination is detected additional plume assessment wells will be installed to delineate the contamination.

A complete ecological characterization of the wetlands and the creeks will be included in the comprehensive assessment. The wetlands along Fourmile Branch were impacted by the operation of the F-and H- Area Seepage basins (3,4). However, since the basins stopped receiving waste water and began to undergo closure, there has already been evidence of recovery by natural flushing. Upper Three Runs and McQueen Branch wetlands are not as well characterized as those of Fourmile Branch.

Professionals in the environmental restoration community are increasingly questioning the effectiveness of the pump-and-treat approach to groundwater corrective actions (6). One aspect of the comprehensive assessment would focus on laboratory and field studies of alternative technologies for in-situ corrective actions. Some of the technologies under consideration are: immobilization by deep soil mixing, immobilization by in-situ vitrification, extraction of contaminants by electrolytic migration, bioremediation, in-situ precipitation, and containment technologies.

It will be crucial to the comprehensive approach to conduct risk assessments as data become available. The selection of corrective actions should be determined by actual human health and ecological needs rather than being compliance driven. Significant expenditures have already taken place to effect closure actions and these expenditures will continue in future closures. The additional expense of groundwater corrective actions must be commensurate with the additional benefits to be gained. Current data available in the GSA do not indicate a risk to operating personnel or to the offsite population. However, as additional data become available they will need to be closely evaluated. Long term impacts must also be carefully assessed through a formal risk assessment process. SRS proposes continuing statistical evaluation of the monitoring data to identify changes that would cause corrective actions to be initiated earlier than currently deemed necessary.

Fourteen deliverables have been identified for submission to the EPA and SCDHEC over a period of approximately six years if the plan is approved. These are: Comprehensive Assessment Strategy Document, Criteria for Initiation of Corrective Actions, GSA Hydrogeologic Assessment Report - Phase 1, Monitoring and Data Collection Plan - Phase 1, Unsaturated Zone Characterization, Stream and Wetlands Characterization, GSA Hydrogeologic Assessment Report - Phase 2, Monitoring and Data

Collection Plan - Phase 2, GSA Hydrogeologic Assessment Report - Phase 3, Groundwater Flow and Transport Modeling, Risk Assessment Summary, Feasibility Studies and Assessment of Innovative Technologies, Recommendations for Corrective Action, and Executive Summary.

SUMMARY

The comprehensive assessment of the GSA will be the basis for a conceptual plan for groundwater corrective remediation of the GSA as a whole. The comprehensive assessment will include an interpretation of existing data, a plan for acquisition of additional data, a proposal for a monitoring program, and conceptual design and testing of appropriate corrective actions. Groundwater modeling will be used to simulate the hydrogeologic system and gage the effectiveness of proposed corrective action scenarios. Risk assessment will be use to justify a decision not to remediate contamination or to quantify the benefits of proposed corrective actions.

The initial response from the regulatory agencies has been to request that a preliminary risk assessment be conducted immediately on units where corrective action is currently driven by regulations. If such an assessment confirms the initial evaluation that none of these units present a near-term risk, the regulatory agencies would then consider allowing a deferral to individual action to allow time for the comprehensive strategy to be implemented

REFERENCES

1. M. A. Ebra and C. M. Lewis, "Proposal: Comprehensive Groundwater Quality Assessment and Corrective Action Plan for the General Separations Areas, Savannah River Site", NMP-ERT-900022, Westinghouse Savannah River Company (December 3, 1990).

2. M. A. Phifer, "Closure of a Mixed Waste Landfill - Lessons Learned", WSRC-MS-90-275, Westinghouse Savannah River Company (January, 1991).

3. "Application for a Hazardous Waste Part B Postclosure Care Permit, Volume 4, F-Area Hazardous Waste Management Facility", Savannah River Site, U. S. Department of Energy (December 3, 1990).

4. "Application for a Hazardous Waste Part B Postclosure Care Permit, Volume 5, H-Area Hazardous Waste Management Facility", Savannah River Site, U. S. Department of Energy (December 3, 1990).

5. Mary K. Harris, Rolf K. Aadland, and Thomas M. Westbrook, "Lithological and Hydrogeological Characteristics of the Tertiary Hydrostratigraphic Systems of the General Separations Area, Savannah River Site, South Carolina", Proceedings of the Second Bald Head Island Conference on Coastal Plains Geology, University of North Carolina, Wilmington (November, 1990).

6. Curtis C. Travis and Carolyn B. Doty, "Can Contaminated Aquifers at Superfund Sites Be Remediated?", Environmental Science and Technology, Volume 24, Number 10 (October 1990).

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TABLE I. RCRA CLOSURES IN THE GSA

FACILITY	WASTE TYPE
Mixed Waste Management Facility	solid, radioactive, hazardous
F Area Seepage Basins	aqueous, radioactive, hazardous
H Area Seepage Basins	aqueous, radioactive, hazardous
F Area Vitrified Clay Pipes, fence out	aqueous, radioactive, hazardous
H Area Vitrified Clay Pipes, fence out	aqueous, radioactive, hazardous
LLRWDF*	solid, radioactive, hazardous

* Low Level Radioactive Waste Disposal Facility

TABLE II. RFI/RI SITES IN THE GSA

SITE	WASTE TYPE
Tank 16	high level radioactive, aqueous
F Burning/Rubble Pits	construction rubble
Burma Road Rubble Pit	construction rubble
Old H Seepage Basin	aqueous, radioactive, hazardous
Old F Seepage Basin	aqueous, radioactive, hazardous
F & H Acid Caustic Basins	aqueous, hazardous
F & H Coal Pile Runoff Basins	stormwater runoff
F Vitrified Clay Pipes, fence in	aqueous, radioactive, hazardous
H Vitrified Clay Pipes, fence in	aqueous, radioactive, hazardous
Inactive LLRWDF	solid, radioactive, hazardous
LLRWDF	solid, radioactive, hazardous
Tank 37 CTS* Line Leak	high level radioactive, aqueous

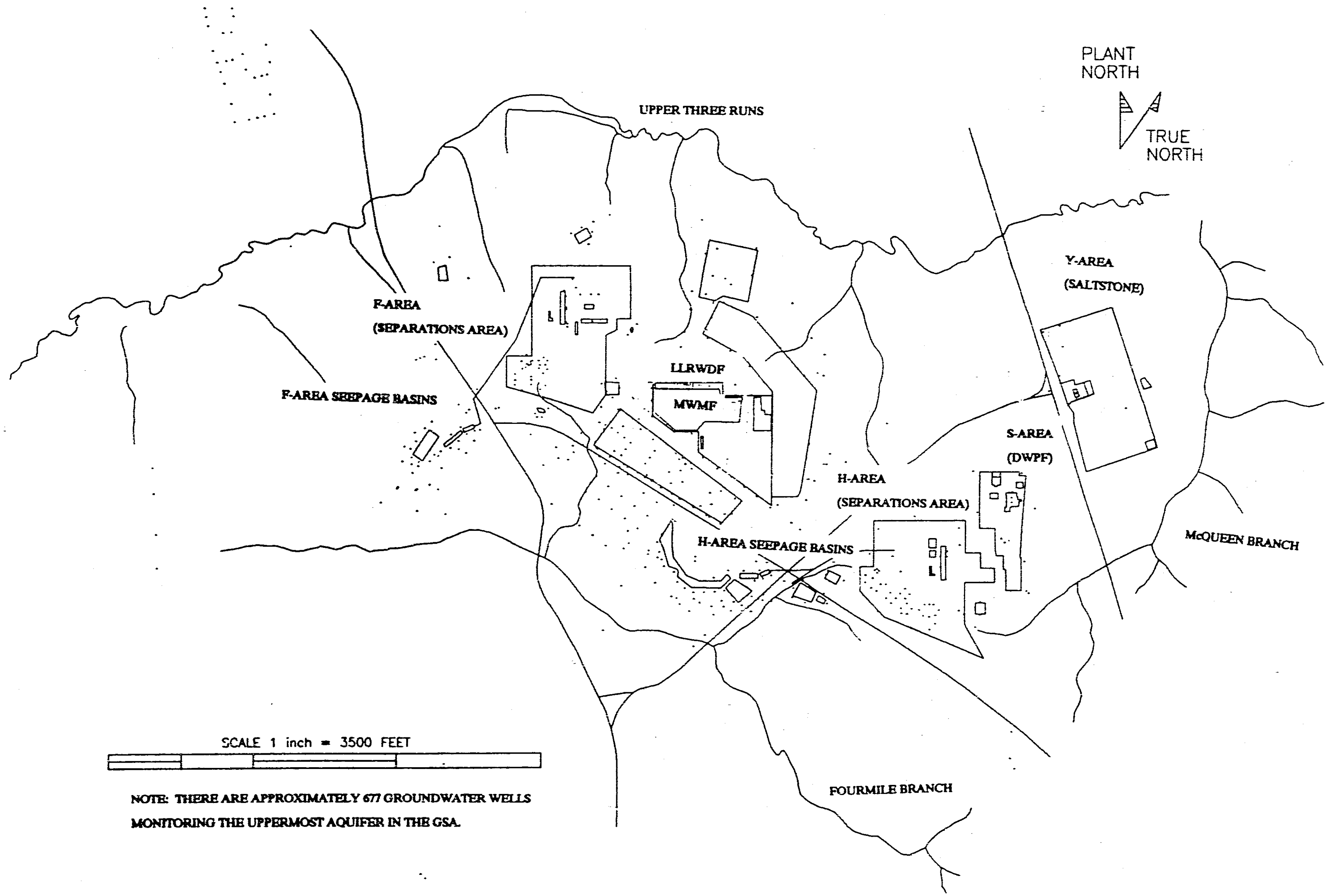
* Condensate Transfer System

RELATIVE LOCATION OF THE GSA IN THE SAVANNAH RIVER SITE

FIGURE 1

FIGURE 2

GENERAL SEPARATIONS AREA WELL LOCATIONS AND FACILITIES



NOTE: THERE ARE APPROXIMATELY 677 GROUNDWATER WELLS MONITORING THE UPPERMOST AQUIFER IN THE GSA.

GENERAL SEPARATIONS AREA 1Q90 AQUIFER ZONE IIB2 SURFACE

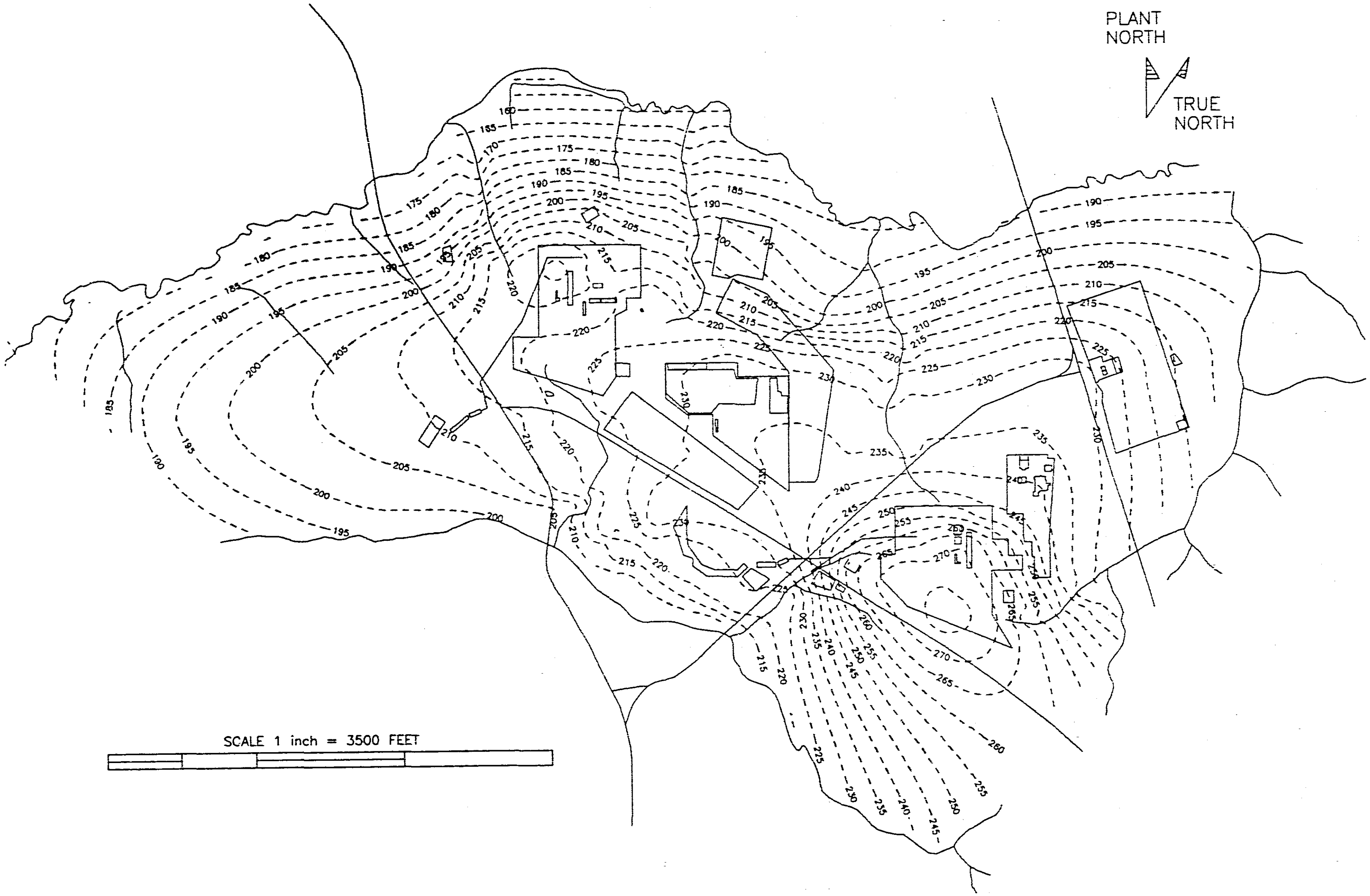


FIGURE 3

END

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