

Research and Development

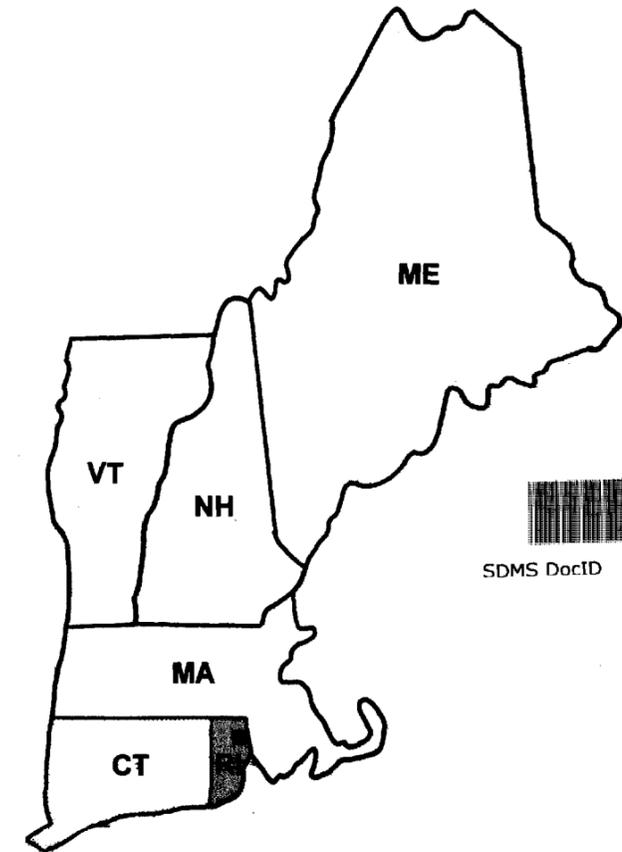


AERIAL PHOTOGRAPHIC ANALYSIS OF CENTREDALE MANOR SITE SUBAREA North Providence, Rhode Island

Addendum Report

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AERIAL PHOTOGRAPHIC ANALYSIS OF
CENTREDALE MANOR SITE SUBAREA

North Providence, Rhode Island

Addendum Report

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ABSTRACT

This addendum report presents the results of an analysis of historical aerial photographs of the Centredale Manor site subarea (CERCLIS ID# RID981203755), located in North Providence, Providence County, Rhode Island. Two sets (dates) of black and white historical photographs from 1974 and 1976 were analyzed to produce this report. The analysis of this subarea documents possible landfilling, patterns of hazardous waste disposal, and any other activities and conditions of environmental significance at the subarea and provides operational remote sensing support to U.S. Environmental Protection Agency (EPA) Region 1 field investigations under the Comprehensive Environmental, Response, and Liability Act (CERCLA).

Results of the analysis reveal that in 1974 all buildings in the northern portion of the subarea had been removed and disturbed ground, accumulations of debris and earthen material, staining, and standing liquid were present. Debris and earthen material were also noted within the northern portion of the drainageway along the eastern side of the subarea. Approximately 345 drums were associated with a large liquid-filled impoundment. Liquid discharges from this impoundment flowed into an adjacent drainageway and the Woonasquatucket River. An additional 135 drums were present adjacent to the Woonasquatucket River. By 1976, the subarea was partially vegetated and inactive; however, certain large areas of staining were still apparent.

The EPA Environmental Sciences Division, Landscape Ecology Branch in Las Vegas, Nevada, prepared this report for the EPA Region 1 Hazardous Waste Management Division in Boston, Massachusetts, and the EPA Office of Emergency and Remedial Response in Washington, D.C.

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INTRODUCTION

This addendum report presents the results of an analysis of historical aerial photographs of Centredale Manor site subarea (CERCLIS ID# RID981203755), located in North Providence, Providence County, Rhode Island (Figures 1 and 2). Two sets (dates) of black-and-white historical photographs from 1974 and 1976 were analyzed to produce this report. An earlier photographic analysis report (TS-PIC-2000120S) assessed environmentally significant features and activities at the subarea from 1939 through 2000. This addendum report documents additional environmentally significant features and activities occurring at the subarea in 1974 and 1976. This analysis provides operational remote sensing support to U.S. Environmental Protection Agency (EPA) Region 1 field investigations under the Comprehensive Environmental, Response, and Liability Act (CERCLA).

The Centredale Manor site subarea, with an areal extent of approximately 4.3 hectares (11 acres), is located south of Smith Street (U.S. Highway 44) and east of the Woonasquatucket River in North Providence, Rhode Island, and consists of the Centredale property and an adjacent property entitled Brook Village (EPA, 1999). Surface drainage flows to the west directly into the Woonasquatucket River and also towards the south through a drainageway along the east side of the subarea. Topography at the Centredale Manor site subarea is relatively flat with elevation being approximately 34 meters (112 feet) above sea level (USGS, 1975).

In the northern portion of the subarea, all buildings had been removed by 1974 and disturbed ground, accumulations of debris and earthen material, and staining were present. Debris and earthen material were also noted within the northern portion of the drainageway along the eastern side of the subarea. Approximately 325 stacked and scattered drums were evident near and within a large liquid-filled impoundment observed in the central portion of the subarea. Two discharge points at the impoundment allowed liquid to flow into an adjacent drainageway and the Woonasquatucket River. Additional drums, debris, and

staining were present within the southern portion of the subarea. Approximately 135 additional drums were noted adjacent to the Woonasquatucket River. By 1976, the subarea was partially vegetated and lacked features that would indicate activity at the subarea; however, certain large areas of staining were still apparent.

A Glossary, defining features or conditions identified in this report, follows the Photographic Analysis section. Sources for all maps, aerial photographs, and collateral data used in the production of this report are listed in the References section. A list of all aerial photographs that were identified and evaluated for potential application to this study can be obtained by contacting the EPA Work Assignment Manager. Historical aerial photographs used in the analysis of this site have been digitally scanned and printed for use in this report. A transparent overlay with interpretative data is affixed to each of the digital prints. See the Methodology section for a discussion of the scanning and printing procedures.

The EPA Environmental Sciences Division, Landscape Ecology Branch in Las Vegas, Nevada, prepared this report for the EPA Region 1 Hazardous Waste Management Division in Boston, Massachusetts, and the EPA Office of Emergency and Remedial Response in Washington, D.C.

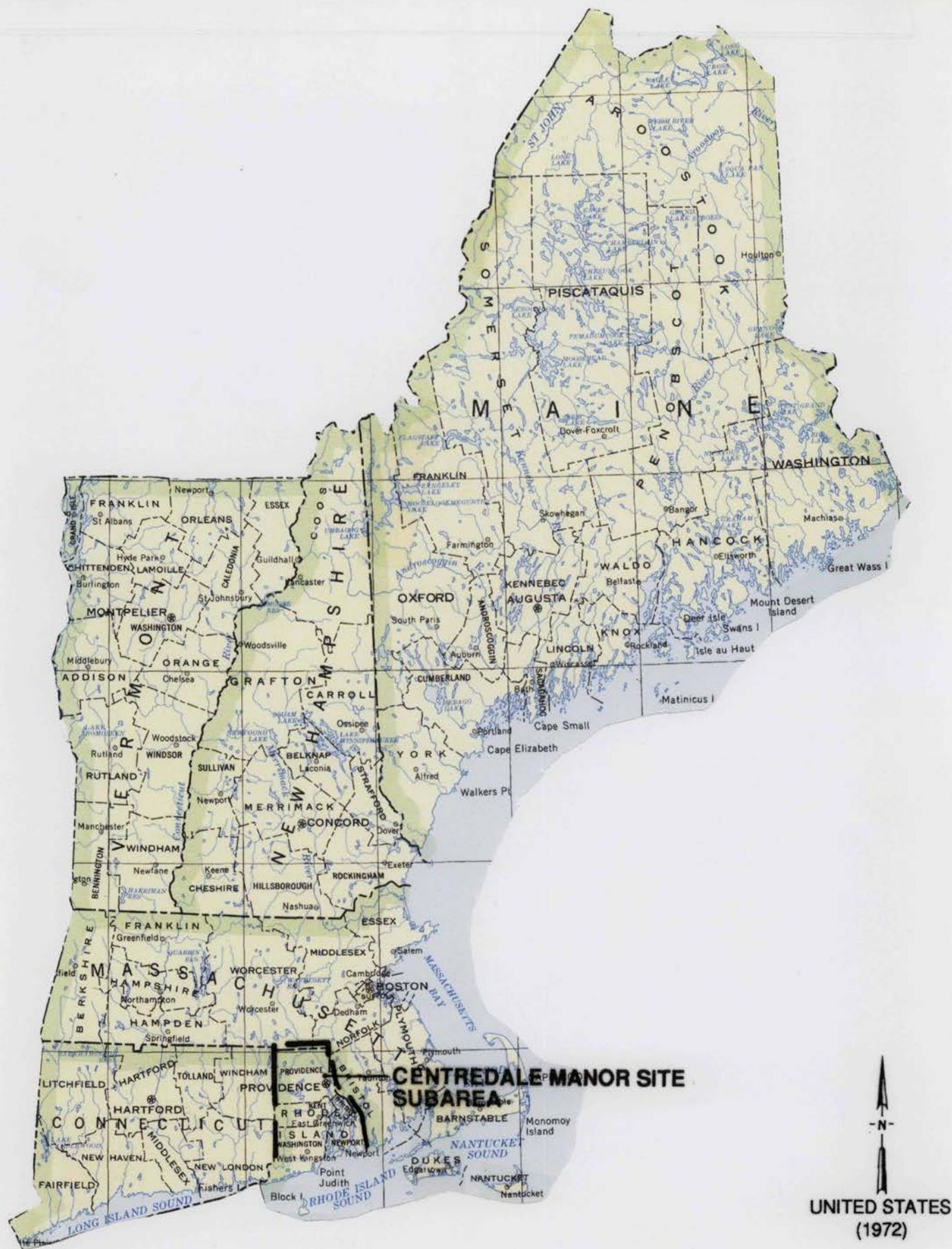


Figure 1. Study area location map, Rhode Island (USGS, 1972).
Approximate scale 1:3,125,000.



Figure 2. Local study area location map, North Scituate and Providence, Rhode Island (USGS, 1975). Approximate scale 1:24,000.

METHODOLOGY

This report was prepared using a standard methodology that includes the following steps:

- data identification and acquisition,
- photographic analysis and interpretation, and
- graphics and text preparation.

These steps are described below. Subsections also address details related to specific kinds of analyses that may be required to identify environmental features such as surface drainage and wetlands. All operational steps and processes used to perform this work (including data identification and acquisition, photographic analysis and interpretation, and graphics and text preparation) adhere to strict QA/QC guidelines and standard operating procedures (SOPs). These guidelines and procedures are documented in the Master Quality Assurance Project Plan (QAPP) prepared for Remote Sensing Support Services Contract No. 68-D-00-267 (LMS, 2001).

Data identification and acquisition included a search of government and commercial sources of historical aerial film for the study area. Photographs with optimal spatial and temporal resolution and image quality were identified for acquisition. In addition, U.S. Geological Survey (USGS) topographic maps were obtained to show the study area location and to provide geographic and topographic context.

To conduct this analysis, the analyst examined diapositives (transparencies) of historical aerial photographs showing the study area. Diapositives are most often used for analysis instead of prints because the diapositives have superior photographic resolution. They show minute details of significant environmental features that may not be discernible on a paper print.

A photographic analyst uses a stereoscope to view adjacent, overlapping pairs of diapositives on a backlit light table. In most cases, the stereoscope

is capable of various magnifications up to 60 power. Stereoscopic viewing involves using the principle of parallax (observing a feature from slightly different positions) to observe a three-dimensional representation of the area of interest. The stereoscope enhances the photo interpretation process by allowing the analyst to observe vertical as well as horizontal spatial relationships of natural and cultural features.

The process of photographic analysis involves the visual examination and comparison of many components of the photographic image. These components include shadow, tone, color, texture, shape, size, pattern, and landscape context of individual elements of a photograph. The photo analyst identifies objects, features, and "signatures" associated with specific environmental conditions or events. The term "signature" refers to a combination of components or characteristics that indicate a specific object, condition, or pattern of environmental significance. The academic and professional training, photo interpretation experience gained through repetitive observations of similar features or activities, and deductive logic of the analyst as well as background information from collateral sources (e.g., site maps, geologic reports, soil surveys) are critical factors employed in the photographic analysis.

The analyst records the results of the analysis by using a standard set of annotations and terminology to identify objects and features observed on the diapositives. Significant findings are annotated on overlays attached to the photographic or computer-reproduced prints in the report and discussed in the accompanying text. Annotations that are self-explanatory may not be discussed in the text. The annotations are defined in the legend that accompanies each print and in the text when first used.

Objects and features are identified in the graphics and text according to the analyst's degree of confidence in the evidence. A distinction is made between certain, probable, and possible identifications. When the analyst believes the identification is unmistakable (certain), no qualifier is used. Probable is used when a limited number of discernible characteristics allow the analyst to be reasonably sure of a particular identification. Possible is used when only a few characteristics are discernible, and the analyst can only infer an identification.

The prints in this report have been reproduced, either by photographic or computer methods, from the original film. Reproductions are made from the original film and may be either contact (the same size) prints or enlargements, depending on the scale of the original film. Any computer-produced prints used in this report are generated from scans of the film at approximately 1,300 dots per inch (dpi) and printed at 720 dpi. Although the reproductions allow effective display of the interpretive annotations, they may have less photographic resolution than the original film. Therefore, some of the objects and features identified in the original image and described in the text may not be as clearly discernible on the prints in this report.

Study area boundaries shown in this report were determined from aerial photographs or collateral data and do not denote legal property lines or ownership.

Surface Drainage

The surface drainage analysis produced for this report identifies the direction and potential path that a liquid spill or surface runoff would follow based on the topography of the terrain and the presence of discernible obstacles to surface flow. The analyst determines the direction of surface drainage by stereoscopic analysis of the aerial photographs and by examining USGS topographic maps. Site-specific surface drainage patterns are annotated on the map or photo overlay. Where the direction of subtle drainage cannot be determined, an indeterminate drainage line symbol is used. Regional surface flow is ascertained from the USGS topographic maps.

PHOTOGRAPHIC ANALYSIS

An overview of the most environmentally significant features from the 1970 photographs and presented in the previous report for this subarea (EPA, 2000), is given below to provide continuity for discussion between the results of the analysis in that report and the first year (1974) of analysis of this addendum report.

MARCH 9, 1970 (excerpted from EPA, 2000)

Section 1 - Northern and Central Portions of the Subarea

Five large stains are evident within the building complex and a large area of possible waste disposal and possible drums are evident to the south. Further to the south is a grouping of 288 probable drums. Three impoundments (IM-1, IM-2, and IM-3) totaling approximately 2,095 square meters (22,538 square feet) in areal extent, are visible in the central portion of the subarea. Dark-toned discharge flows from the two smaller impoundments into the third and largest impoundment (IM-2). South of the largest impoundment is a large area of staining and moist soil that is possibly due to overflow from the largest impoundment as well as possible spreading (landfarming) of wastes.

Section 2 - Extreme Southern Portion of the Subarea

The waste disposal area at the southern end of the access road continues to be active. A large area of solid waste, standing liquid, possible stains, areas of light-toned material, and possible drums are observed in this portion of the subarea.

Section 3 - West of the Subarea Access Road

Along the Woonasquatucket River are three groupings of stacked probable drums with a combined total of 1,168 drums. A leaking horizontal tank, possible drums, and possible solid waste are noted to the south. Further to the south is additional possible solid waste.

SEPTEMBER 27, 1974 (FIGURE 3)

Photographic resolution of this photodate is excellent, thus enabling a detailed assessment of all features in the subarea.

Section 1 - Northern and Central Portions of the Subarea

All five site buildings (not annotated) have been removed from the northern portion of the subarea since 1970. One partial building foundation is observed as well as an area of staining (ST). An access road leads north to this stained area. The ground around these former building locations has been disturbed (DG; partially annotated) and a portion of the debris (DB) and some earthen material (EM) resulting from the demolition of the buildings have been deposited in the vicinity of the northern portion of the drainageway. Grading, as evidenced by the presence of bulldozer blade marks (not annotated), is apparent in this area and also within a partially vegetated (PV) area on the east side of the drainageway. An additional accumulation of debris and earthen material has been deposited in the drainageway east of two possible remnants of the former buildings. A large area of staining and possible standing liquid (SL) is noted directly south of the possible building remnants. Continuing to the south another very large area of staining and an area of standing liquid are noted adjacent to a large accumulation of mounded debris and earthen material. Grading is also in evidence within this area. Other isolated areas of staining (not annotated) are located throughout this portion of the subarea.

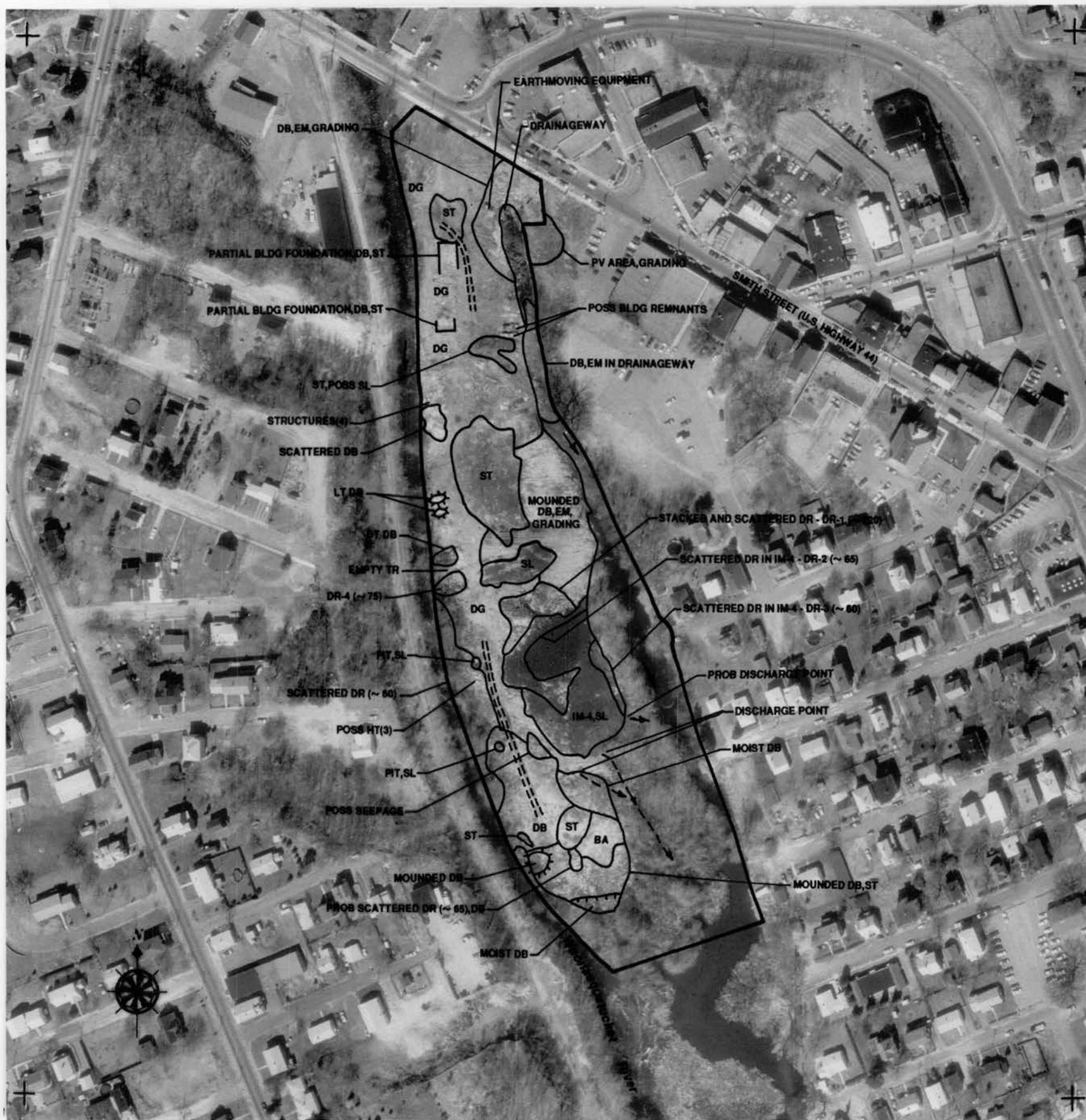
Further to the south, a large impoundment (IM-4) containing standing liquid is now present where the former Impoundment 1 (IM-1) and a portion of a stained area were noted in 1970 (not annotated). An area of stacked and scattered drums (DR-1; approximately 220 in number) is located on the north side of the impoundment and scattered drums are present within and along the northwestern and eastern sides of the area. Two areas of drums, one with approximately 65 drums (DR-2) and the other with 60 drums (DR-3) are within impoundment IM-4. A berm (not annotated) is present along the south side of impoundment IM-4 and two discharge points and a probable discharge point are evident and permit flow of liquid material from this impoundment to the nearby drainageway and to the Woonasquatucket River. An area of possible seepage is also noted near the southwest corner of the impoundment.

Section 2 - Extreme Southern Portion of the Subarea

At the southern terminus of the north-south oriented access road (partially visible and annotated) that leads south from the former building complex is the large waste disposal area (not annotated) observed in 1970. The area now contains debris, mounded debris, moist debris, staining, approximately 15 probable scattered drums, a small pit with standing liquid, and a bare area (BA).

Section 3 - West of Subarea Access Road

South of the partial building foundation observed in Section 1 and adjacent to the Woonasquatucket River are four small structures and scattered debris. Continuing south along the river, two piles of light-toned debris (LT DB), an empty trench (TR), an area of dark-toned (DT DB) debris, and an area containing approximately 75 drums (DR-4) are observed. This accumulation of drums is located directly adjacent to the river. South of these drums is an area where approximately 60 additional drums are scattered. A small pit with staining and three possible horizontal tanks (HT) are also located within this area.



INTERPRETATION CODE

—	STUDY AREA
--->	DRAINAGE
—>	FLOW
...	VEHICLE ACCESS
⊖	MOUNDED MATERIAL (EXTENSIVE)
BA	BARE AREA
DB	DEBRIS
DG	DISTURBED GROUND
DR	DRUMS
DT	DARK-TONED
EM	EARTHEN MATERIAL
IM	IMPOUNDMENT
LT	LIGHT-TONED
SL	STANDING LIQUID
ST	STAIN
TR	TRENCH
PV	PARTIALLY VEGETATED

Figure 3. Centredale Manor site subarea, March 25, 1974. Approximate scale 1:2,250.

MAY 5, 1976 (FIGURE 4)

Resolution of this photograph is poor, which precludes assessment of smaller features such as drums, structures, and possible horizontal tanks, noted in the 1974 photographs. Thus, only larger environmentally significant features such as areas of staining are discernable. Additionally, stereographic photographs were not available for this date of photography; therefore, the analysis was conducted monoscopically.

No new environmentally significant features or activities are noted since 1974. The site is partially vegetated throughout the large disturbed area located in the northern and central portions of the site (not annotated) and no new areas of disturbance, access roads, or routes are apparent. This indicates that the site is apparently inactive. The location of debris and earthen material noted at the north end of the drainageway in 1974 is depicted. The partial building foundation remains visible, as does a large stain immediately to the southeast along the access road. Further to the south, two other areas of staining are noted. To the east of these stains is a former location of debris and earthen material. Continuing to the south there is another large stained area that was part of impoundment IM-4 noted in 1974. The dashed outline depicts the remainder of the areal extent of the former impoundment. The location of the former large waste disposal area at the southern end of the north-south access road in 1974 is also depicted.



Figure 4. Centredale Manor site subarea, May 5, 1976. Approximate scale 1:2,215.

GLOSSARY

Access Road - A paved or unpaved route of vehicular access.

Dark- (DT), Medium- (MT), or Light-Toned (LT) - Tones of features in question are compared with the darkest and lightest tones of gray (if using B&W photography) on the print.

Debris (DB) - The remains of anything that can be identified as being broken down, destroyed, demolished, or dismantled.

Disturbed Ground (DG) - A rough area where the ground surface has been dug up or overturned.

Drums (DR) - Metal cylinders used for the storage, transportation, or disposal of materials.

Impoundment (IM) - A liquid containment area that appears to be related to activity on a site but does not appear to be used for waste storage, disposal and/or treatment.

Stain (ST) - A residue or discoloration resulting from a spill, discharge, or removed/dispersed materials.

Standing Liquid (SL) - A small, shallow, temporary collection of liquid, not necessarily waste. Not to include liquid contained in impoundments, trenches, pits, etc.

Tanks - Vertical tanks (VT), horizontal tanks (HT), pressure tanks (PT), tank farms, and solid waste management units. A large receptacle, container, or structure for holding liquid or gas.

Trench (TR) - A long, narrow excavation unrelated to drainage.

REFERENCES

MAPS

Source ^a	Figure	Name	Scale	Date
USGS	1	United States	1:2,500,000	1972
USGS	2	North Scituate, RI	1:24,000	1975
USGS	2	Providence, RI	1:24,000	1975

COLLATERAL INFORMATION

- EPA. 1999. Collateral information supplied by EPA Region 1 as attachment to Remote Sensing Services Request Form. 7 pp.
- EPA 2000. Aerial Photographic Analysis of Centredale Manor Site Subarea, North Providence, Rhode Island, TS-PIC 20001120S, dated July, 2000. Environmental Sciences Division, National Exposure Research Laboratory, Office of Research and Development. 49pp.
- LMS (Lockheed Martin Services). 2001. Master Quality Assurance Project Plan. Prepared for EPA Environmental Sciences Division. Contract 68-D-00-267. Las Vegas, Nevada.

AERIAL PHOTOGRAPHS

Photo source ^a	Figure	Date of acquisition	Original scale	Film type ^b	Mission I.D.	Source frame #
AIRPHO	3	03-25-74	1:9,600	B&W	-	728,729
KEY	4	05-05-76	1:38,000	B&W	44007	96 ^c

^aAIRPHO Air Photographics, Inc., Martinsburg, West Virginia
 KEY Keystone Aerial Surveys, Inc., Philadelphia, Pennsylvania
 USGS U.S. Department of Interior, U.S. Geological Survey, Washington, D.C.

^bB&W Black-and-white

^cThis photo is monoscopic; no associated stereographic photograph(s) were available.