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Research and Development



AERIAL PHOTOGRAPHIC ANALYSIS CENTREDALE MANOR SITE SUBAREA

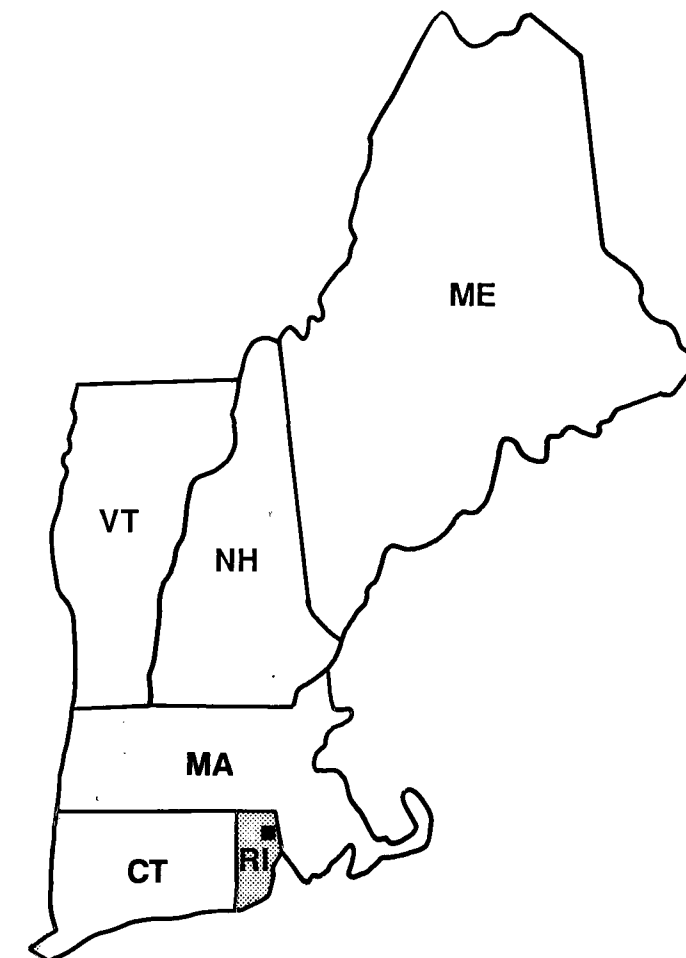
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AERIAL PHOTOGRAPHIC ANALYSIS
CENTREDALE MANOR SITE SUBAREA

North Providence, Rhode Island

by

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NOTICE

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ABSTRACT

This report presents the results of an analysis of historical aerial photographs of the Centredale Manor site subarea (CERCLIS ID# RID981203755) located in North Providence, Rhode Island. The subarea is a portion of a larger Centredale Manor Restoration Project Superfund Site. A total of thirteen sets (dates) of black-and-white historical photographs spanning the years from 1939 to 2000 were analyzed to produce this report. According to collateral information (EPA 2000), a chemical manufacturing company and a drum recycling company operated at the subarea from the 1940s through the mid-1970s. Evidence of disposal of hazardous wastes was found at the subarea. The overall photographic analysis of this subarea documents landscape morphology, patterns of hazardous waste disposal, and other observable activities and conditions of environmental significance at the subarea. Measurements of the areal extent of impoundments and determination of approximate number of drums was also performed. Analysis results from this report provide operational remote sensing support to Region 1 field investigations under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA).

In 1939, facility buildings were present in the northern portion of the subarea. South of the buildings a relatively undisturbed natural landscape which consisted of herbaceous, shrub, and forested wetlands was observed. From 1951 through 1956 environmentally significant features were located adjacent to a probable drum recycling facility and at two waste disposal areas to the south. Typical features during this time period included a pit with standing liquid, staining, groupings of probable drums, solid waste, light- and dark-toned material, moist soil, and mounded earthen material. In 1955 a small drainageway flowed from an area of light-toned material in the southernmost waste disposal area towards the Woonasquatucket River. The most significant amount of waste-related activity and the greatest areal extent of waste-related features on the subarea were observed from 1962 through 1970. During that time period, environmentally significant features such as possible and probable drums, staining, solid and liquid wastes, mixtures of solid waste and drums,

impoundments, and light-toned material were observed from the probable drum recycling facility in the central portion of the subarea to the end of an access road in the southern portion of the subarea. Twelve probable drum groupings were identified within which approximately 3,007 probable drums were estimated. In 1965, 353 confirmed drums were observed. Three impoundments and a small pit were also observed during the study period with a total approximate areal extent of 2,098 square meters (22,571 square feet). In 1970 spillage from a possible tanker trailer and a possible horizontal tank flowed into two impoundments. Staining and moist soil, possibly indicative of spreading of liquid wastes, were also noted in 1970. All waste-related activity had apparently ceased by 1979 and the central and southern portions of the subarea were vegetated. However, from 1981 through 1995 possible seepage, moist soil, one area of standing liquid, several areas of sparse vegetation, disturbed ground, and bare areas were identified in the central and southern portions of the subarea. By 2000 remedial operations were apparently underway.

In addition, the 1951 and 2000 photographs were analyzed for relative changes in extent of wetlands. Loss of wetlands since 1951, approximately 2.6 hectares (6.5 acres), was observed primarily in the central and northwestern portions of the subarea.

The U.S. Environmental Protection Agency (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 report presents the results of an analysis of historical aerial photographs of the Centredale Manor site subarea (CERCLIS ID# RID981203755, Figures 1 and 2) located in North Providence, Providence County, Rhode Island. A total of thirteen sets (dates) of black-and-white and color historical photographs spanning the years from 1939 to 2000 were analyzed to produce this report. The report years include 1939, 1951, 1955, 1956, 1962, 1963, 1965, 1970, 1979, 1981, 1985, 1995, and 2000. A chemical manufacturing company and a drum recycling company operated on the subarea from the 1940s through the mid-1970s. Approximately 400 drums have been found at the subarea and subsequent analysis of samples from the subarea revealed high concentrations of hazardous materials (EPA 1999). The overall photo analysis of this subarea documents landscape morphology, patterns of hazardous waste disposal, and other observable activities and conditions of environmental significance at the subarea and provides operational remote sensing support to Region 1 field investigations under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA).

The subarea that is the focus of this report is a portion of the larger Centredale Manor Restoration Project Superfund Site ("Site") located in North Providence, Rhode Island. The main portion of the Site is known as 2072 and 2074 Smith Street (or, plat 14, lots 200 and 250). The Site extends on the flood plain of the Woonasquatucket River from the main portion of the Site south to the Allendale Dam. Currently, two high rise buildings (Centredale Manor and Brook Village) are located on the Site. In addition to the buildings, the Site is covered by a roadway and parking lots. On the eastern side of the Site is a drainage swale that begins near the northern portion to the Site which extends south and then curves to the west before discharging into a wooded wetland south of the Site and eventually into the Woonasquatucket River (EPA 2000). The Site consists of all contaminated areas within this area as well as other locations to which contamination from that area has come to be located, or from which said contamination emanated.

The Centredale Manor subarea, approximately 4.3 hectares (11 acres) in extent, is situated south of Smith Street (US Highway 44) and east of the Woonasquatucket River in North Providence, and is located on the narrow river floodplain. The Centredale Manor subarea is comprised of the Centredale property and an adjacent property entitled Brook Village (EPA 1999, Figure 2). The two properties are combined in this report because environmentally significant features and activities occur on both properties. Surface drainage flows in two directions, to the west directly into the Woonasquatucket River and towards the south through the drainage swale on the east side of the site. The topographic relief at the subarea is relatively flat and site elevation is approximately 34 meters (112 feet) (USGS 1975).

The areal extents of impoundments present at the subarea during the study period were measured. However, actual counts of all drums present on the subarea could not be performed due to the limited resolution of the photographs used for the analysis. Therefore, an alternative method for deriving approximate numbers of a portion of the drums located at the subarea was employed. See the Methodology section for a detailed discussion. Due to good photographic resolution of the 1965 photographs, partial drums counts within certain drum groupings were possible for only this year. The approximate number of drums, partial drum counts, and the areal extent of impoundments or pits are presented in tabular form at the end of the text for each applicable analysis year and also at the end of the Analysis Summary section. Additionally, the areal extent of wetlands on the 1951 and 2000 photographs was determined and presented in the Wetland Analysis paragraph at the end of the 1951 and 2000 analysis text and in the Analysis Summary section. No rectification of aerial photographs was performed, thus the photographs do not meet National Map Accuracy Standards. Therefore, all areal measurements derived from the photographs should be considered approximate in nature.

See the Analysis Summary section for a discussion of the major waste-related features and activities at the Centredale Manor subarea.

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 U.S. Environmental Protection Agency (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.

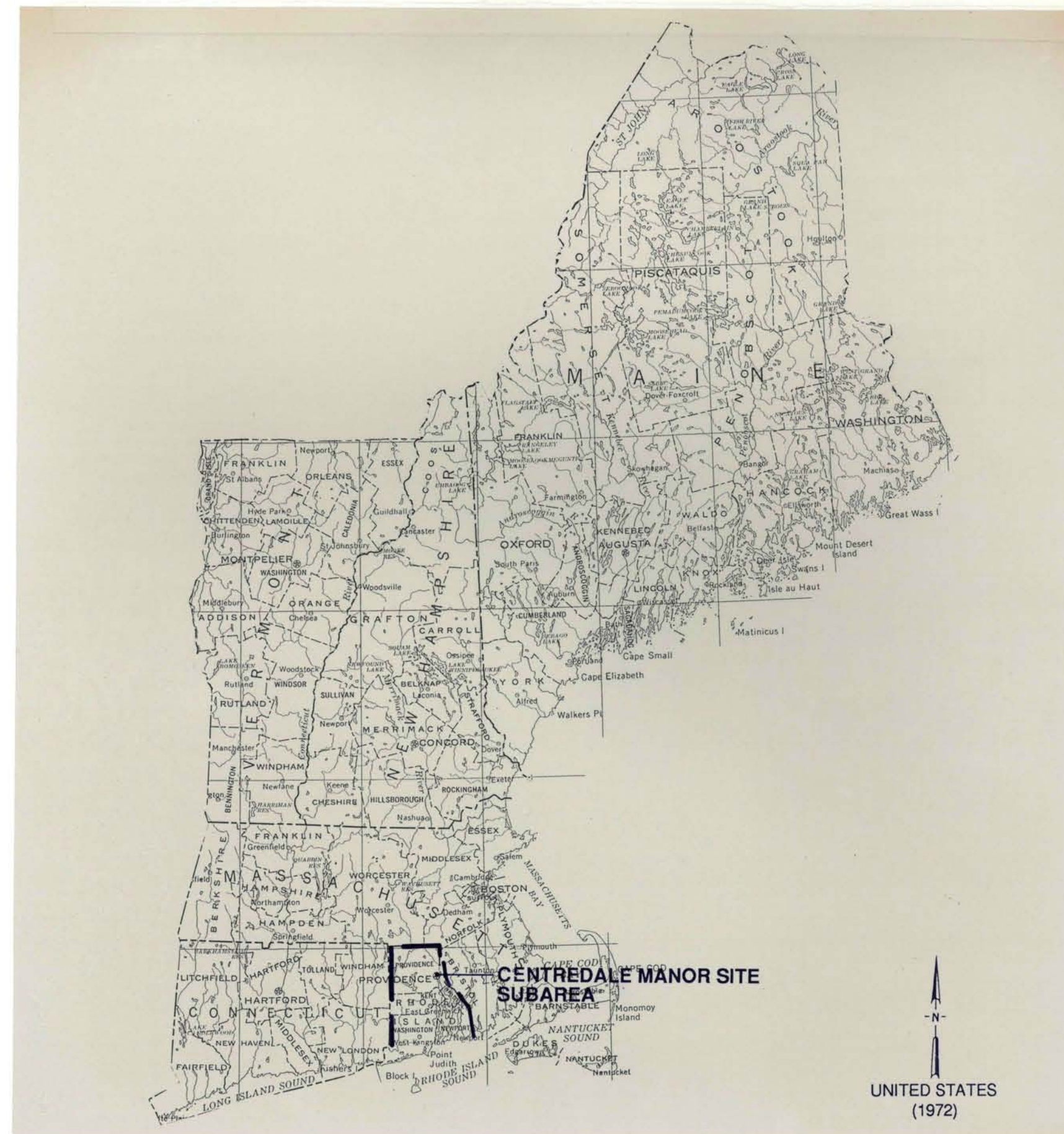


Figure 1. Study area location map, Rhode Island (USGS 1972). Approximate scale 1:3,125,000.

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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 Technical Support Contract No. 68-C5-0065 (LESAT 1999).

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., subarea 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.

Determinations of the areal extents of impoundments present at the subarea were performed. However, due to resolution limitations of the photographs used for the analysis, actual counts of all drums located at the subarea could not be conducted. An alternative method was developed to derive an approximate count of a portion of the drums located at the subarea. The length and width of any stacked probable drums (identifiable on the photographs) were measured on the photographic film and converted to the approximate dimensions on the ground. These dimensions were then divided by the diameter of an individual 55-gallon drum (approximately 2 feet) to yield number of probable drums on each side of the stack. These numbers were then multiplied to yield an approximate number of drums in one vertical level of the stack. If another level of drums was stacked atop the first level (as determined by shadow lengths), the approximate number of drums was doubled to yield a total figure. This method could only be used for groupings of drums that were stacked in a rectilinear fashion and could not be used where drums were scattered or randomly grouped or for groupings of horizontally stacked drums. However, due to good photographic resolution of the 1965 photographs, partial drum counts were possible within certain non-stacked drum groups.

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. Surface drainage patterns specific to the subarea 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.

Wetland Analysis

The most general type of wetland analysis involves differentiating wetland and nonwetland areas. An analyst utilizes aerial photographs, soil surveys, hydric soils data, National Wetland Inventory maps, and other available data to identify wetland boundaries and drainage networks within a study area. If requested, more detailed analyses are conducted using the Cowardin Classification System (Cowardin 1979) to provide information regarding vegetation types and hydrologic regimes. Analyses of photography from several years can be compiled to assess changes in wetland areas and measurements can be conducted to quantify results. Field checking of final products can confirm and refine mapping results and aid in compliance with jurisdictional and legal requirements. Results of the wetlands analysis are presented on clear acetate overlays attached to the 1951 and 2000 photographs.

ANALYSIS SUMMARY

In 1939 a few facility buildings were present on the northern portion of the subarea. The remainder of the subarea was relatively undisturbed with the exception of a possible waste disposal area in the southern portion of the subarea. In 1951 a probable drum recycling facility* (EPA 1999) was observed. A small pit, possible drainageway, and a group of probable stacked drums (DR-1, containing 128 probable drums) were present nearby. In 1951 an access road led from the probable drum recycling facility to a waste disposal area where solid waste, scattered light-toned material, a horizontal tank, and a small building were evident. To the south, although no access road was evident, a second waste disposal area was located where mounded earthen material and light-toned material were observed. In 1951, when the first of two wetlands assessments was performed, herbaceous, shrub, and forested wetlands were present in the central and southern portions of the subarea as well as along the Woonasquatucket River. By 1955 waste-related activities had expanded. Two additional groups of stacked probable drums (DR-2, 484 probable drums; DR-3, 176 probable drums) were noted. Staining, probable solid waste, and moist soil were visible. Due to forest canopy cover, only three small deposits of light-toned material were observed in the southern end of the subarea. The extent of waste-related features again increased in 1956. South of the probable drum recycling facility were two groups of stacked drums (DR-4, 176 probable drums; DR-5, 224 probable drums) as well as a large stain. At the waste disposal area to the south liquid wastes partially covered with earthen material, i.e., landfarming, light-toned material, staining, possible staining, and several unidentified rectilinear objects were apparent. A stained access road led to the second waste disposal area where bare earthen material, stains, and light-toned material were present.

In 1962 the extent of waste-related features increased compared to 1956. South of the probable drum recycling facility, numerous groups of probable drums were present. Of these, three were stacked (DR-6, 99 probable drums; DR-7, 108 probable drums; and DR-8, 72 probable drums). Other groups of scattered

probable drums were also evident. To the south stains, standing liquid, a large area covered with ice, and an area where grading scars were evident. In the extreme southern portion of the subarea at the end of the access road, solid waste, probable drums, standing liquid, a horizontal tank, and light-toned material were identified. West of the access road were parked vehicles and probable drums. By 1963 probable drums were observed near the probable drum recycling facility. A large vegetated area was located south of the facility where many of the waste-related features evident in 1962 were located. The waste disposal area at the end of the access road was also vegetated, but this area also contained vegetated solid waste, light-toned material, and liquid waste. Solid waste, probable solid waste, possible stains, and possible drums were noted west of the access road. By 1965 the extent of waste-related features had increased in the central and southern portions of the site compared to 1963. Due to an increased resolution of the 1965 photographs, compared to 1963, partial drums counts were conducted at several drum groupings (GR-1 through GR-9). The total number of drums counted for GR-1 through GR-9 was 353. At stacked drum grouping DR-9 approximately 84 probable drums were present. Possible landfarming, consisting of large areas of standing liquid and fill, was evident in the central portion of the subarea. In 1970 three impoundments, observed in the central portion of the subarea (IM-1, IM-2, and IM-3) were 237 square meters (2,549 square feet), 1,828 square meters (19,666 square feet), and 30 square meters (323 square feet) in areal extent, respectively. Additionally, three new groups of probable stacked drums (DR-10, DR-11, and DR-12) were identified west of the access road. The approximate number of probable drums in these groupings were 144, 383, and 640, respectively. The number of probable drums at DR-9 had increased from 84 in 1965 to the 288 probable drums observed in 1970. Due to poorer resolution since 1965 actual counts of drums were not possible.

All waste-related activities had apparently ceased by 1979. A new large building and parking lot had been constructed on the Brook Village property. South of the parking lot waste-related features observed from 1951 through 1970 were not present. Partially vegetated disturbed ground was evident adjacent to the parking lot, but the central and southern portions of the subarea were vegetated. In 1981 disturbed ground, vegetated grading scars, sparse vegetation, possible seepage, moist soil, a small drainageway containing liquid, and light-toned material were evident south of the parking lot. By

1985 an addition to the northernmost parking lot had been constructed. In 1985 and 1995 a small area of standing liquid, areas of sparse vegetation, disturbed ground, and bare areas were identified south of this parking lot. By 1985 a second building (Centredale Manor) and parking lot had been constructed. In 2000 subarea remedial operations were in progress. Several fences had been constructed, possible monitoring wells were in place, and natural vegetation had been removed and land graded at two large areas within the subarea.

As noted in Table 1, the total number of probable drums estimated at the subarea during the study period was 3,007 and a total of 353 actual drums were counted in 1965. The total areal extent of all impoundments/pits was 2,098 square meters (22,571 square feet).

TABLE 1. Approximate Probable Drum Count, Actual Drum Count, and Areal Extent of Impoundments/Pits, Centredale Manor Subarea 1939-2000.

Analysis Year	Approx. Probable Drum Count	Actual Drum Count	Approximate Areal Extent of Impoundments/Pits
1951	128	-	3 meters ²
1955	660	-	-
1956	400	-	-
1962	279	-	-
1965	84	353	-
1970	1,456	-	2,095 meters ²
Total	3,007	353	2,098 meters ²

Wetland Analysis

In 1951 the entire subarea south of the probable drum recycling facility was a combination of herbaceous, scrub, and forested wetlands. Wetlands also extended north along the Woonasquatucket River. The areal extent of wetlands in 1951 was approximately 3 hectares (7.3 acres). By 2000, approximately 2.6 hectares (6.5 acres) been lost. The loss occurred primarily in the southern and northwestern portions of the subarea.

PHOTOGRAPHIC ANALYSIS

The Centredale Manor Restoration Project Superfund Site ("site") is located in North Providence, Rhode Island (Figure 2). The main portion of the Site is known as 2072 and 2074 Smith Street (or, plat 14, lots 200 and 250). The Site extends on the floodplain of the Woonasquatucket River from the Main portion of the Site south to the Allendale Dam. Currently, two high rise buildings (Centredale Manor and Brook Village) are located on the Site. In addition to the buildings, the Site is covered by roadway and parking lots. The topographic relief at the Site is relatively flat and Site elevation is approximately 34 meters (112 feet) (USGS 1975). On the eastern portion of the Site is a drainage swale that begins near the northern portion to the Site and extends south, then curves to the west and discharges into a wooded wetland south of the Site and eventually into the Woonasquatucket River (EPA 2000). The Site consists of all contaminated areas within this area as well as any other location to which contamination from that area has come to be located, or from which that contamination came.

The Centredale Manor subarea is located on a narrow strip of land in North Providence, Rhode Island, south of Smith Street (US Highway 44) and east of the Woonasquatucket River (Figure 2). The Brook Village property is situated adjacent to the Centredale Manor property and is included as part of the subarea in this report. The topographic relief at the Centredale Manor subarea is relatively flat and subarea elevation is approximately 34 meters (112 feet) above sea level (USGS 1975). Surface drainage flows to the west directly into the Woonasquatucket River and also towards the south through a drainageway on the east side of the subarea.

Features identified in collateral data supplied by EPA Region 1 are denoted with an asterisk (*) in the text and on the each photographic overlay on which it occurs. If an important feature or condition discussed is not extant or no change has occurred since the last photographic date, no further annotation or discussion is given. Should activity resume, the significant feature(s) or change(s) will again be annotated and discussed.

MAY 15, 1939 (FIGURE 3)

A monoscopic ozalid paper copy of the original 1939 photograph was available for analysis of the subarea; however, photographic resolution was poor and very little information was obtained from it. The northern portion of the subarea consists of industrial facilities while the southern half was comprised primarily of herbaceous, shrub, and forested wetlands. The surrounding area consists of commercial, industrial, and residential properties. The larger facility buildings are visible and one area south of the buildings appears to coincide with the location of a waste disposal area (WDA) observed in 1951 (Figure 4). There do not appear to be any other disturbances of the natural landscape south of the buildings.



INTERPRETATION CODE

—	SITE BOUNDARY
← — —	DRAINAGE
← — —	FLOW
== ==	VEHICLE ACCESS
x x x x x	FENCE
⬢	MOUNDED MATERIAL (EXTENSIVE)
BA	BARE AREA
DG	DISTURBED GROUND
DR	DRUMS
DT	DARK-TONED
EX	EXCAVATION
FL	FILL
HT	HORIZONTAL TANK
IM	IMPOUNDMENT
LT	LIGHT-TONED
M	MATERIAL
MM	MOUNDED MATERIAL
OF	OUTFALL
SL	STANDING LIQUID
ST	STAIN
SW	SOLID WASTE
URO	UNIDENTIFIED RECTILINEAR OBJECTS
VT	VERTICAL TANK
WDA	WASTE DISPOSAL AREA
WL	WETLAND
*	COLLATERAL DATA

Figure 3. Centredale Manor site subarea, May 15, 1939. Approximate scale 1:3,970.

OCTOBER 26, 1951 (FIGURE 4)

In the northern portion of the subarea, the southernmost building in the building complex is probably the drum recycling facility referenced in the collateral information (EPA 1999). On the south side of the facility is a stain (ST) and a small pit containing possible standing liquid (SL). The pit is approximately 3 square meters (32 square feet) in extent. A possible drainageway leads west from the pit towards the Woonasquatucket River. A smokestack is also observed adjacent and north of the drum recycling facility. To the west of the probable drum recycling facility* are vehicles parked at the end of an access road that leads to Smith Street. Approximately 128 stacked probable drums (DR-1) are located to the south. An access road leads south to a waste disposal area where solid waste (SW), scattered light-toned material (LTM), a possible horizontal tank (HT), and a small building are located. North of the waste disposal area is a vegetated possible excavation (EX) where waste-related activities may have taken place between 1939 and 1951. A small area of possible staining is present to the west. South of the waste disposal area is a second waste disposal area with a deposit of earthen material that is elevated at its southern end. Light-toned material is also present. This is the approximate location of the possible waste disposal observed in 1939. To the east of the subarea is a small deposit of solid waste at the west end of a residential street.

Table 2. Approximate Probable Drum Count, and Areal Extent of Impoundments/Pits, Centredale Manor Subarea 1951.

Drum/Impoundment Name	Approx. Probable Drum Count	Approximate Areal Extent of Impoundment/Pit
DR-1	128	-
Pit	-	3 meters ²
Total	128	3 meters ²

Wetland Analysis

The entire subarea south of the probable drum recycling facility is a combination of herbaceous, scrub, and forested wetlands. Wetlands also extend north along the Woonasquatucket River to Smith Street. The areal extent of the wetlands is approximately 3 hectares (7.3 acres).



INTERPRETATION CODE

—	SITE BOUNDARY
← — —	DRAINAGE
← — —	FLOW
== ==	VEHICLE ACCESS
x x x x x	FENCE
	MOUNDED MATERIAL (EXTENSIVE)
BA	BARE AREA
DG	DISTURBED GROUND
DR	DRUMS
DT	DARK-TONED
EX	EXCAVATION
FL	FILL
HT	HORIZONTAL TANK
IM	IMPOUNDMENT
LT	LIGHT-TONED
M	MATERIAL
MM	MOUNDED MATERIAL
OF	OUTFALL
SL	STANDING LIQUID
ST	STAIN
SW	SOLID WASTE
URO	UNIDENTIFIED RECTILINEAR OBJECTS
VT	VERTICAL TANK
WDA	WASTE DISPOSAL AREA
WL	WETLAND
*	COLLATERAL DATA

Figure 4. Centredale Manor site subarea, October 26, 1951. Approximate scale 1:2,470.

MAY 19, 1955 (FIGURE 5)

Adjacent to a facility building in the northern portion of the subarea are four process-related vertical tanks. Staining is present in the lot west and south of the probable drum recycling facility. A separate stain is visible on a bare area (BA) to the southwest. The small pit, standing liquid, stain, and small drainageway observed in 1951 are not present. A new building has been constructed to the south of the probable drum recycling facility. Immediately west of this new building is a large stack of probable drums (DR-2) containing approximately 484 drums. Dark-toned mounded material (DTMM) is evident next to DR-2. Possible solid waste is evident at the south end of the new building. South of DR-2 is DR-3 which contains approximately 176 drums. Unidentified objects (not annotated) are observed to the east and south of DR-3. South of DR-3 are three groupings of possible drums. West of DR-3 is an area of possible staining and an area of confirmed staining. Further to the south is a large area of probable solid waste, moist soil, and a truck trailer. This is the approximate location of the northernmost waste disposal area observed in 1951. Tree canopy precluded a detailed assessment of the southernmost waste disposal area discussed in the 1951 analysis year; however, three areas of light-toned material are in the general vicinity of this waste disposal area. A probable drainageway leads from the southernmost of these areas of light-toned material to the Woonasquatucket River. To the east of the subarea, the solid waste observed in 1951 at the end of a residential street is now covered with vegetation.

Table 3. Approximate Probable Drum Count, and Areal Extent of Impoundments/Pits, Centredale Manor Subarea 1955.

Drum/Impoundment Name	Approx. Probable Drum Count	Approximate Areal Extent of Impoundment/Pit
DR-2	484	-
DR-3	176	-
Total	660	-



INTERPRETATION CODE

—	SITE BOUNDARY
←	DRAINAGE
→	FLOW
==	VEHICLE ACCESS
x x x x x	FENCE
⬭	MOUNDED MATERIAL (EXTENSIVE)
BA	BARE AREA
DG	DISTURBED GROUND
DR	DRUMS
DT	DARK-TONED
EX	EXCAVATION
FL	FILL
HT	HORIZONTAL TANK
IM	IMPOUNDMENT
LT	LIGHT-TONED
M	MATERIAL
MM	MOUNDED MATERIAL
OF	OUTFALL
SL	STANDING LIQUID
ST	STAIN
SW	SOLID WASTE
URO	UNIDENTIFIED RECTILINEAR OBJECTS
VT	VERTICAL TANK
WDA	WASTE DISPOSAL AREA
WL	WETLAND
*	COLLATERAL DATA

Figure 5. Centredale Manor site subarea, May 19, 1955. Approximate scale 1:2,400.

MAY 1, 1956 (FIGURE 6)

The 1956 photographs were acquired during leaf-off conditions allowing for a more detailed subarea assessment in the wetland area in the southern portion of the subarea as compared to the 1955 assessment.

A total of five process-related vertical tanks are now discerned next to the large building in the northern portion of the subarea. Staining observed in 1955 in the facility lot remains. Adjacent to the probable drum recycling facility are two new groupings of stacked probable drums (DR-4 and DR-5). These groupings are situated at the approximate location of DR-2 in 1951. Approximately 176 and 224 probable drums, respectively, are present at DR-4 and DR-5. Further to the south a large heavy stain is evident at the former location of DR-3 in 1955, and unidentified rectilinear objects (URO) are observed nearby. Continuing south, waste disposal area operations in the central portion of the subarea continue to expand and now consist of possible landfarming, possible staining, light-toned mounded material (LTMM) and large areas of staining. A stained access road leads to the south. West of this road is light-toned material and to the east is additional staining and light-toned material. At the end of the road is an apparently new waste disposal area where bare earthen material, staining, and light-toned material are evident. The bare earthen material extends to the riverbank. The probable drainageway seen at this location in 1955 is not observed in this 1956 photograph.

Table 4. Approximate Probable Drum Count, and Areal Extent of Impoundments/Pits, Centredale Manor Subarea 1956.

Drum/Impoundment Name	Approx. Probable Drum Count	Approximate Areal Extent of Impoundment/Pit
DR-4	176	-
DR-5	224	-
Total	400	-



INTERPRETATION CODE

—	SITE BOUNDARY
←	DRAINAGE
→	FLOW
==	VEHICLE ACCESS
x x x x x	FENCE
⬭	MOUNDED MATERIAL (EXTENSIVE)
BA	BARE AREA
DG	DISTURBED GROUND
DR	DRUMS
DT	DARK-TONED
EX	EXCAVATION
FL	FILL
HT	HORIZONTAL TANK
IM	IMPOUNDMENT
LT	LIGHT-TONED
M	MATERIAL
MM	MOUNDED MATERIAL
OF	OUTFALL
SL	STANDING LIQUID
ST	STAIN
SW	SOLID WASTE
URO	UNIDENTIFIED RECTILINEAR OBJECTS
VT	VERTICAL TANK
WDA	WASTE DISPOSAL AREA
WL	WETLAND
*	COLLATERAL DATA

Figure 6. Centredale Manor site subarea, May 1, 1956. Approximate scale 1:2,380.

FEBRUARY 7, 1962 (FIGURE 7)

The number and complexity of features and activities present at the subarea has increased since 1956; therefore, the subarea is divided into three sections for discussion purposes. These sections are Section 1 - northern and central portions of the subarea, Section 2 - extreme southern portion of the subarea, and Section 3 - area west of the subarea access road. Due to the complexity and number of features, these sections are not delineated. There are numerous areas of standing liquid and moist soil (some locations not annotated) present at the subarea. This is probably at least partially attributable to recent precipitation or snow or ice melt. Ice is observed in the river near the bottom edge of this photograph.

Section 1 - Northern and Central Portions of the Subarea

Six process-related vertical tanks are now present next to the large building in the northern portion of the subarea. To the south is a parked tanker truck. West of the probable drum recycling facility (older building) standing liquid is observed on the subarea access road. The facility lot continues to be stained. A possible outfall (OF) is observed at the east side of this older building. Probable drums are located to the west and south of the building; however, only three locations of vertically stacked probable drums (DR-6, DR-7, and DR-8) are observed. The approximate number of probable drums at DR-6, DR-7, and DR-8 are 99, 108, and 72, respectively. Adjacent to DR-8 is a large area of probable standing liquid. East of DR-8 are two small drainageways which trend into the drainageway at the east side of the subarea (not annotated). South of DR-8 are groupings of scattered probable drums, areas of standing liquid, a large area of ice, and an area where grading scars are evident. The areas of ice and grading scars are located where, in 1956, liquid wastes were being spread on the ground and covered with earthen material. South of the ice and grading scars is a large area of standing liquid and a deposit of solid waste. Other areas of standing liquid are noted on the access road that is parallel to and east of the river and leads to the southern portion of the subarea.

Section 2 - Extreme Southern Portion of the Subarea

The access road terminates at the waste disposal area originally identified in 1956. A bare area with two areas of standing liquid is evident as is a large area of mounded solid waste and probable drums, light-toned material, and a horizontal tank. A portion of this area is directly adjacent to the western subarea boundary and the Woonasquatucket River.

Section 3 - West of the Subarea Access Road

Parked vehicles are present at the northern portion of the west side of the access road. Probable drums, including a grouping of horizontally stacked drums and scattered drums are located to the south. Further to the south, along the river, are scattered drums, a new building, probable scattered drums, and an area of grading scars where possible waste materials were present at some time between 1956 and 1962.

Table 5. Approximate Probable Drum Count, and Areal Extent of Impoundments/Pits, Centredale Manor Subarea 1962.

Drum/Impoundment Name	Approx. Probable Drum Count	Approximate Areal Extent of Impoundment/Pit
DR-6	99	-
DR-7	108	-
DR-8	72	-
Total	279	-



INTERPRETATION CODE

—	SITE BOUNDARY
←	DRAINAGE
→	FLOW
==	VEHICLE ACCESS
x x x x x	FENCE
⬭	MOUNDED MATERIAL (EXTENSIVE)
BA	BARE AREA
DG	DISTURBED GROUND
DR	DRUMS
DT	DARK-TONED
EX	EXCAVATION
FL	FILL
HT	HORIZONTAL TANK
IM	IMPOUNDMENT
LT	LIGHT-TONED
M	MATERIAL
MM	MOUNDED MATERIAL
OF	OUTFALL
SL	STANDING LIQUID
ST	STAIN
SW	SOLID WASTE
URO	UNIDENTIFIED RECTILINEAR OBJECTS
VT	VERTICAL TANK
WDA	WASTE DISPOSAL AREA
WL	WETLAND
*	COLLATERAL DATA

Figure 7. Centredale Manor site subarea, February 7, 1962. Approximate scale 1:2,380.

SEPTEMBER 2, 1963 (FIGURE 8)

Section 1 - Northern and Central Portions of the Subarea

Staining is evident north and south of a large building in the northwestern portion of the subarea. Possible solid waste is located adjacent to the facility. Probable drums (three groupings) are noted to the south; however, due to the random distribution of the drums stacked approximate counts could not be ascertained. A deposit of probable solid waste is present at the southern end of a new facility building. Immediately adjacent to the probable solid waste is a denuded area where drainageways were evident in 1962. Continuing south is a diagonally trending cleared area, unidentified rectilinear objects, vegetated solid waste, and a large revegetated area. In 1956 the large revegetated area had been utilized as a waste disposal area and in 1962 scattered drums, solid waste, standing liquid, and an area of grading scars were observed.

Section 2 - Extreme Southern Portion of the Subarea

The areal extent of the solid waste and probable drums located at the end of the access road in 1962 is depicted on this photograph. In this location is an area of vegetated solid waste is evident near the river and to the southeast is apparently new, light-toned material and probable liquid waste. The bare area at the end of the access road and the solid waste to the west of the bare area have vegetated indicating that no large-scale deposition of waste has occurred at these locations since 1962.

Section 3 - West of Subarea Access Road

On the west side of the subarea from north to south near the Woonasquatucket River are areas of probable solid waste, two vehicles, a probable truck trailer, another deposit of probable solid waste, staining, possible staining, possible drums, possible solid waste, and two additional areas of possible drums. The grading scars evident in 1962 are no longer present.

27

APRIL 5, 1965 (FIGURE 9)

Resolution of the 1965 photographs is improved compared to 1963 and partial counting of individual drums within certain drum groupings was performed. Only a partial counting was possible; however, a certain number of individual drums could be identified.

Section 1 - Northern and Central Portions of the Subarea

An area of possible solid waste and an area of probable solid waste noted in 1963 are not present. Several stains (not annotated) observed in the northern portion of the subarea in 1963 are no longer present. Adjacent to a new building first observed in 1963 is DR-9 which consists of approximately 84 probable drums. Note: The prefix "GR" is used to denote drum groupings where partial drum counts were conducted. Adjacent to the probable recycling facility, 72 drums are counted at GR-1. To the southeast at GR-2, 69 drums are observed. East of and contiguous to GR-2 is a large area of staining which trends towards the eastern drainageway. To the south, 41 drums are counted at GR-3 and staining and probable solid waste are also observed. A total of 42 drums along with possible solid waste are noted at GR-4. Staining is visible across an access road on the southeast side of GR-4. Possible landfarming is evident in the central portion of the subarea where a large area of standing liquid and a large area of fill exhibiting grading scars are located. Possible landfarming was also observed in this area in 1956. Continuing south, probable solid waste, a trailer, and staining are observed. To the east is a large area of staining.

Section 2 - Extreme Southern Portion of the Subarea

In this portion of the subarea it appears that waste-related activity has resumed since it was last observed in 1962. Possible solid waste and light-toned material are located around the large bare area at the end of the subarea access road. Possible vehicles are noted on the large bare area.

Section 3 - West of Subarea Access Road

At the northern end of this Section and along the river the probable solid waste observed in 1963 is not present. To the south are vehicles, a truck trailer, and three vertical tanks. Proceeding southward along the river are several drum groupings where partial counts of drums were performed. Totals of 36 and 20 drums, are noted at GR-8 and GR-9, respectively. North of a new building, 21 drums are evident at GR-7 and two circular open-topped tanks are evident nearby. A total of 39 drums are observed at GR-6 along with possible solid waste while at GR-5 there are 13 drums and probable solid waste. Probable debris is noted to the south. At the extreme southern end of this portion of the subarea is a denuded area situated between the Woonasquatucket River and deposits of possible solid waste and light-toned material.

Table 6. Approximate Probable Drum Count, Actual Drum Count, and Areal Extent of Impoundments/Pits, Centredale Manor Subarea 1965.

Drum/Impoundment Name	Approx. Probable Drum Count	Actual Drum Count	Approximate Areal Extent of Impoundment/Pit
DR-9	84	-	-
GR-1 through GR-9	-	353	-
Total	84	353	-



INTERPRETATION CODE

—	SITE BOUNDARY
←	DRAINAGE
→	FLOW
==	VEHICLE ACCESS
x x x x x	FENCE
⬭	MOUNDED MATERIAL (EXTENSIVE)
BA	BARE AREA
DG	DISTURBED GROUND
DR	DRUMS
DT	DARK-TONED
EX	EXCAVATION
FL	FILL
HT	HORIZONTAL TANK
IM	IMPOUNDMENT
LT	LIGHT-TONED
M	MATERIAL
MM	MOUNDED MATERIAL
OF	OUTFALL
SL	STANDING LIQUID
ST	STAIN
SW	SOLID WASTE
URO	UNIDENTIFIED RECTILINEAR OBJECTS
VT	VERTICAL TANK
WDA	WASTE DISPOSAL AREA
WL	WETLAND
*	COLLATERAL DATA

Figure 9. Centredale Manor site subarea, April 5, 1965. Approximate scale 1:2,870.

MARCH 9, 1970 (FIGURE 10)

Due to poorer resolution of the remaining years of photographs used in this analysis, actual drum counts (annotated with the symbol GR) are no longer possible.

Section 1 - Northern and Central Portions of the Subarea

A large building adjacent to the eastern side of the subarea (not previously discussed) has been removed since 1965. A possible stain is visible in the northern portion of the subarea. To the south are five large stains. A large area of possible solid waste and possible drums is present south of these stains. Continuing south is DR-9 where 84 probable drums were observed in 1965 and 288 probable drums are now noted. An area of probable solid waste is observed adjacent to and south of a building which was first noted in 1963. A possible tanker trailer, scattered unidentified rectilinear objects (not annotated), and possible drums are observed southeast of DR-9. South of the possible tanker trailer is Impoundment 1 (IM-1), with an areal extent of approximately 237 square meters (2,549 square feet; see Table 3) and containing dark-toned liquid (not annotated). IM-1 occupies the area where a large area of standing liquid was noted in 1965. A large area of staining is observed on the northwest side of IM-1. Dark-toned discharge from IM-1 flows into IM-2 which is approximately 1,828 square meters (19,666 square feet) in extent. Also, spillage appears to be flowing to the southeast from the possible tanker trailer into IM-2. A possible drainageway at the northern end of the impoundment may allow release of liquid wastes into the drainageway along the eastern side of the subarea. Impoundment 3 (IM-3), with an areal extent of approximately 30 square meters (323 square feet), is southwest of IM-1 and also discharges into IM-2. A small pit and unidentified rectilinear objects (not annotated) are located nearby. South of IM-2 is a large area where stains and moist soil are evident. This is possibly due to overflow from IM-2 and the possible spreading (landfarming) of wastes as was observed in 1956 and 1965. An area of light-toned material is observed to the southwest.

Section 2 - Extreme Southern Portion of the Subarea

The waste disposal area continues to be active. A large deposit of probable solid waste is present along both sides of the southernmost extent of the subarea access road. At the end of the road are a bare area, standing liquid, possible standing liquid, possible stains, areas of light-toned mounded material, and possible solid waste and possible drums.

Section 3 - West of Subarea Access Road

Near the Woonasquatucket River on the west-central side of the subarea, are vehicles and three groupings of stacked probable drums (DR-10, DR-11, and DR-12). The approximate number of probable drums, respectively, are, 144, 383, and 640. Further south is a possible horizontal tank that appears to be leaking or discharging dark-toned liquid southeast (spillage) and across the access road into IM-1. Possible drums and possible solid waste are observed south of the possible horizontal tank. Another area of possible solid waste is noted further south.

Table 7. Approximate Probable Drum Count, and Areal Extent of Impoundments/Pits, Centredale Manor Subarea 1970.

Drum/Impoundment Name	Approx. Probable Drum Count	Approximate Areal Extent of Impoundment/Pit
DR-9	288	-
DR-10	144	-
DR-11	384	-
DR-12	640	-
IM-1	-	237 meters ²
IM-2	-	1,828 meters ²
IM-3	-	30 meters ²
Total	1,456	2,095 meters ²



INTERPRETATION CODE

—	SITE BOUNDARY
←	DRAINAGE
←	FLOW
==	VEHICLE ACCESS
x x x x x	FENCE
⬭	MOUNDED MATERIAL (EXTENSIVE)
BA	BARE AREA
DG	DISTURBED GROUND
DR	DRUMS
DT	DARK-TONED
EX	EXCAVATION
FL	FILL
HT	HORIZONTAL TANK
IM	IMPOUNDMENT
LT	LIGHT-TONED
M	MATERIAL
MM	MOUNDED MATERIAL
OF	OUTFALL
SL	STANDING LIQUID
ST	STAIN
SW	SOLID WASTE
URO	UNIDENTIFIED RECTILINEAR OBJECTS
VT	VERTICAL TANK
WDA	WASTE DISPOSAL AREA
WL	WETLAND
*	COLLATERAL DATA

Figure 10. Centredale Manor site subarea, March 9, 1970. Approximate scale 1:2,600.

SEPTEMBER 20, 1979 (FIGURE 11)

The number of features and amount of activity has decreased substantially at the Centredale Manor subarea since 1970; hence, sections are no longer employed to discuss the environmentally significant features and activities.

All buildings present at the subarea in 1970 have been removed. A new large building and associated parking lot exists on the northwestern portion of the subarea (the Brook Village property). Disturbed ground, probably associated with construction activities, is present adjacent to the south and east of the parking lot and new building. Further to the south is an area of partially vegetated disturbed ground; however, the cause of this disturbance could not be ascertained. Drainageways trending to the east are noted immediately northeast of this area and also within the eastern portion of the disturbed area. Further south, the general area where waste disposal features and activities which were present from 1951 through 1970 is covered with vegetation. Mottled photographic tones in this vegetated area (not annotated) may indicate the presence of conditions that cause vegetation stress. At the southern end of the subarea is a sparsely vegetated area, an area of light-toned material, and an unidentified object. The light-toned material was also present in 1970. No drums or waste disposal-related activity is observed.



INTERPRETATION CODE

—	SITE BOUNDARY
←	DRAINAGE
←	FLOW
==	VEHICLE ACCESS
x x x x x	FENCE
⬭	MOUNDED MATERIAL (EXTENSIVE)
BA	BARE AREA
DG	DISTURBED GROUND
DR	DRUMS
DT	DARK-TONED
EX	EXCAVATION
FL	FILL
HT	HORIZONTAL TANK
IM	IMPOUNDMENT
LT	LIGHT-TONED
M	MATERIAL
MM	MOUNDED MATERIAL
OF	OUTFALL
SL	STANDING LIQUID
ST	STAIN
SW	SOLID WASTE
URO	UNIDENTIFIED RECTILINEAR OBJECTS
VT	VERTICAL TANK
WDA	WASTE DISPOSAL AREA
WL	WETLAND
*	COLLATERAL DATA

Figure 11. Centredale Manor site subarea, September 20, 1979. Approximate scale 1:2,450.

MARCH 18, 1981 (FIGURE 12)

Disturbed ground, probably attributable to construction and landscaping activities, is evident east of the large building in the northern (Brook Village) portion of the subarea. A large area of vegetated grading scars, indicative of ground disturbance since 1979, is observed south of the building parking lot. Five areas of moist soil are evident within the grading scars area. Two large areas of sparse vegetation are noted, one to the northeast and the other to the south of the moist soil areas. Also to the south are three small unidentified rectilinear objects. Possible seepage flowing to the southwest is noted in the southern portion of the subarea. Other features located in this general vicinity include a small drainageway where liquid is evident, a small shed (an unidentified rectilinear object in 1979), and an area of moist soil. To the south is the small deposit of light-toned material observed in 1970 and 1979.



INTERPRETATION CODE

—	SITE BOUNDARY
← — —	DRAINAGE
← — —	FLOW
== == ==	VEHICLE ACCESS
x x x x x	FENCE
⬭	MOUNDED MATERIAL (EXTENSIVE)
BA	BARE AREA
DG	DISTURBED GROUND
DR	DRUMS
DT	DARK-TONED
EX	EXCAVATION
FL	FILL
HT	HORIZONTAL TANK
IM	IMPOUNDMENT
LT	LIGHT-TONED
M	MATERIAL
MM	MOUNDED MATERIAL
OF	OUTFALL
SL	STANDING LIQUID
ST	STAIN
SW	SOLID WASTE
URO	UNIDENTIFIED RECTILINEAR OBJECTS
VT	VERTICAL TANK
WDA	WASTE DISPOSAL AREA
WL	WETLAND
*	COLLATERAL DATA

Figure 12. Centredale Manor site subarea, March 18, 1981. Approximate scale 1:2,450.

AUGUST 23, 1985 (FIGURE 13)

The Brook Village property parking lot has been extended to the south and partially vegetated fill (FL) is observed adjacent to it. To the south near the river are several areas of sparse vegetation that may be indicative of vegetation stress. One small area of standing liquid is also present. A small possible shed is observed south of the parking lot of a new large building (Centredale Manor*) that has been constructed since 1981.

No other environmentally significant features are noted.



INTERPRETATION CODE

—	SITE BOUNDARY
←	DRAINAGE
→	FLOW
==	VEHICLE ACCESS
x x x x x	FENCE
⬭	MOUNDED MATERIAL (EXTENSIVE)
BA	BARE AREA
DG	DISTURBED GROUND
DR	DRUMS
DT	DARK-TONED
EX	EXCAVATION
FL	FILL
HT	HORIZONTAL TANK
IM	IMPOUNDMENT
LT	LIGHT-TONED
M	MATERIAL
MM	MOUNDED MATERIAL
OF	OUTFALL
SL	STANDING LIQUID
ST	STAIN
SW	SOLID WASTE
URO	UNIDENTIFIED RECTILINEAR OBJECTS
VT	VERTICAL TANK
WDA	WASTE DISPOSAL AREA
WL	WETLAND
*	COLLATERAL DATA

Figure 13. Centredale Manor site subarea, August 23, 1985. Approximate scale 1:2,450.

APRIL 7, 1995 (FIGURE 14)

West of the Centredale Manor building is disturbed ground (DG), bare areas, and standing liquid within a small depression. This is the same area where sparse vegetation and standing liquid were noted in 1985. A small area of disturbed ground is evident to the north. The possible shed present in 1985 is now confirmed as the shed cited in the collateral information (EPA 1999. A single vertical tank (VT) is present on the north side of the Centredale Manor building. The partially vegetated fill noted in 1985 south of the Brook Village parking lot is now completely vegetated.



INTERPRETATION CODE

	SITE BOUNDARY
	DRAINAGE
	FLOW
	VEHICLE ACCESS
	FENCE
	MOUNDED MATERIAL (EXTENSIVE)
BA	BARE AREA
DG	DISTURBED GROUND
DR	DRUMS
DT	DARK-TONED
EX	EXCAVATION
FL	FILL
HT	HORIZONTAL TANK
IM	IMPOUNDMENT
LT	LIGHT-TONED
M	MATERIAL
MM	MOUNDED MATERIAL
OF	OUTFALL
SL	STANDING LIQUID
ST	STAIN
SW	SOLID WASTE
URO	UNIDENTIFIED RECTILINEAR OBJECTS
VT	VERTICAL TANK
WDA	WASTE DISPOSAL AREA
WL	WETLAND
*	COLLATERAL DATA

Figure 14. Centredale Manor site subarea, April 17, 1995. Approximate scale 1:2,440.

MARCH 4, 2000 (FIGURE 15)

It appears that remedial activity is ongoing at the Centredale Manor subarea. A small deposit of mounded earthen material and associated vehicular tracks and four small areas of disturbed ground are evident east of the Brook Village property building. To the southwest a temporary silt fence* is apparent along a portion of the western side of the subarea. Also, the northernmost parking lot is partially fenced. A group of drums* is present in this parking lot. Natural or landscaped vegetation has been removed from the entire area south of the parking lot and the surface has been graded. Stacked wood and wood chips* and a small deposit of mounded earthen material are present along the riverbank. Features noted in this area in 1995 (small depression, standing liquid, disturbed ground, and bare areas) are no longer present. A grouping of utility poles* are present at the northern end of the southernmost parking lot. This parking lot and a portion of the center of the subarea are fenced. South of the parking lot, the natural wetland vegetation has been removed and graded. The small shed noted in 1995 at the southern end of the parking lot is no longer present. To the south and adjacent to the Woonasquatucket River are two small hexagonal-shaped landscaping excavations*. Additionally, stabilizing embankments are evident on the southwestern and southeastern boundaries of the subarea. Two areas of minor erosion are observed on these boundaries. No other environmentally significant features or activities are observed at the subarea.

Wetland Analysis

Wetlands remaining in 2000 are approximately 0.33 hectare (0.83 acre) in extent. Wetland vegetation removed since 1951 is depicted on the Wetland Analysis overlay. The approximate areal extent of wetlands removed from 1951 to 2000 is 2.6 hectares (6.5 acres). Wetlands have been removed primarily from the central and northwestern portions of the subarea. Nonwetland areas, e.g., a small possible waste disposal area observed in 1939, and two waste disposal areas evident in 1951 are also depicted.



INTERPRETATION CODE

—	SITE BOUNDARY
←	DRAINAGE
→	FLOW
==	VEHICLE ACCESS
x x x x x	FENCE
⬭	MOUNDED MATERIAL (EXTENSIVE)
BA	BARE AREA
DG	DISTURBED GROUND
DR	DRUMS
DT	DARK-TONED
EX	EXCAVATION
FL	FILL
HT	HORIZONTAL TANK
IM	IMPOUNDMENT
LT	LIGHT-TONED
M	MATERIAL
MM	MOUNDED MATERIAL
OF	OUTFALL
SL	STANDING LIQUID
ST	STAIN
SW	SOLID WASTE
URO	UNIDENTIFIED RECTILINEAR OBJECTS
VT	VERTICAL TANK
WDA	WASTE DISPOSAL AREA
WL	WETLAND
*	COLLATERAL DATA

Figure 15. Centredale Manor site subarea, March 4, 2000. Approximate scale 1:2,440.

GLOSSARY

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

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

Debris - 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.

Excavation Area (EX) - An area where earth or other material is being removed in order to alter the ground level (e.g., building construction).

Fill (FL) - Earth, stones, or other material that is used to build up the level of an area of ground.

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.

Material (M) - Raw or waste materials on or in the vicinity of the site.

Mounded Material (MM) - Piles of raw or waste materials on or in the vicinity of the site.

Outfall (OF) - The place where an effluent is discharged into the environment.

Solid Waste (SW) - Any garbage, refuse, or sludge from a waste treatment, water supply treatment plant, or air pollution control facility, and other discarded material, including solid or semi-solid material resulting from industrial, commercial, mining, and agricultural operations, and from community activities; does not include solid or dissolved material in domestic sewage, or solid or dissolved materials in irrigation return flows or industrial discharges.

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.

Waste Disposal Area (WDA) - An area where waste materials are discarded.

Wetlands - Areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas.

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

Cowardin 1979. Classification of Wetlands and Deepwater Habitats of the United States. FWS/OBS 79/31. Fish and Wildlife Service, U. S. Department of the Interior. 131 pp.

EPA. 2000. Collateral information provided by Region 1, Remote Sensing Services Request Form. 4 pp.

LESAT (Lockheed Environmental Systems & Technologies Co.). 1999. Master Quality Assurance Project Plan. Prepared for EPA Environmental Sciences Division. Contract 68-C5-0065. Las Vegas, Nevada.

AERIAL PHOTOGRAPHS

Photo source ^a	Figure	Date of acquisition	Original scale	Film type ^b	Mission I.D.	Source frame #
RIPLAN	3	05-15-39	1:38,000	B&W	-	884
NAS	4	10-26-51	1:20,000	B&W	DPJ	98,99
USGS	5	05-19-55	1:24,000	B&W	GS-VJU	3,4
NOS	6	05-01-56	1:30,000	B&W	-	131,132
AERVPT	7	02-07-62	1:20,000	B&W	118814	484,485
ASCS	8	09-02-63	1:20,000	B&W	DPJ	158,159
AVPT	9	04-05-65	1:10,000	B&W	1342	1073,1074
USGS	10	03-09-70	1:24,000	B&W	GS-VCLG	225,226
NOS	11	09-20-79	1:30,000	B&W	79EP	130,131
USGS	12	03-18-81	1:24,000	B&W	GS-VESC	48,49
NOS	13	08-23-85	1:30,000	B&W	EP	1938,1939
CEI	14	04-17-95	1:6,500	B&W	15383	104,105
EPA	15	03-04-00	1:5,120	B&W	GOED	2,3,4

^aAERVPT Aerial Viewpoint, 10200 Richmond, Suite 12, Houston, Texas

ASCS U.S. Department of Agriculture, Agricultural Stabilization and Conservation Service, Salt Lake City, Utah

CEI Col-East Aerial and Mapping, Inc., North Adams, Massachusetts

EPA U.S. Environmental Protection Agency, Environmental Sciences Division, Las Vegas, Nevada

NAS National Air Survey, Bladensburg, Maryland

NOS National Ocean Service, Coast and Geodetic Survey, Washington, D.C.

RIPLAN Rhode Island Planning Department, Providence, Rhode Island

USGS U.S. Department of Interior, U.S. Geological Survey, Washington, D.C.

^bB&W Black-and-white