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REMEDIAL INVESTIGATION/ FEASIBILITY STUDY FOR THE TRI-CITIES BARREL SITE IN FENTON, NEW YORK

FINAL WORK PLAN (REVISION NO. 6)

PREPARED

BY

ENVIRONMENTAL STRATEGIES CORPORATION

DECEMBER 24, 1992

Reston, VA • San Jose, CA • Boxborough, MA • Chester, UK • London, UK

Contents

Contents
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Contents
(continued)

Contents
(continued)

Contents
(continued)

Contents
(continued)

Contents
(continued)

1.0 Introduction

Environmental Strategies Corporation (ESC) has prepared this Final Revised Work Plan for a remedial investigation/feasibility study (RI/FS) at the Tri-Cities Barrel site, Broome County, New York for the participating parties. This Final Revised Work Plan has been prepared so that the RI/FS activities described herein can be performed by an independent consultant to the participating parties under a Consent Order with the United States Environmental Protection Agency (USEPA).

This Work Plan modifies Revision Nos. 1 and 2 of the January 1991 Draft Work Plan which were prepared by Roy F. Weston (WESTON) under Work Assignment No. 006-2L5V of WESTON's USEPA Region II ARCS Contract No. 68-W9-0022 and Revision Nos. 3, 4, and 5 of the Draft Revised Work Plan which were prepared by ESC for the participating parties.

The Statement of Work to prepare the WESTON Work Plan described the Tri-Cities Barrel site as a 3.5-acre operating site, including three former lagoons south of Interstate 88 (I-88). Reportedly, an initial site visit by WESTON personnel included a conversation with the site operator, who indicated that a fourth wastewater lagoon had been constructed south of I-88 during the closure of the three onsite lagoons referenced in the Statement of Work. In addition, the site operator indicated that the construction of I-88 required the excavation of a fifth lagoon just north of the former operating site. During the July 2, 1991, site visit, Mr. Gary Warner stated that wastewater was not discharged to any lagoon north of I-88.

Concurrent with this site visit, WESTON personnel acquired and reviewed existing data from USEPA, New York State Department of Environmental Conservation (NYSDEC), and New York State Department of Transportation (NYSDOT) files. Included in the NYSDOT information was a 1965 aerial photograph of the site and a 1967 topographic map prepared in preparation for the construction of I-88.

Reportedly, the 1965 aerial photo confirmed the presence of the fifth lagoon described above, as well as three additional bermed structures, suspected by WESTON of also being former wastewater lagoons. Therefore, a total of three confirmed and five suspected lagoons were identified by WESTON.

The WESTON Work Plan stated that evaluation of the NYSDOT topographic map confirms that these bermed structures contained fluids. At this point, WESTON suspected and interpreted the potential area of contamination ("site" boundary) to include all lagoons and surrounding areas and proposed expansion of the site area from 3.5 acres to approximately 13 acres.

During the preparation of the WESTON Work Plan, WESTON personnel reviewed historical photographs at the Soil Conservation Service office in Binghamton, New York. Data from this review were combined with NYSDOT information to arrive at a proposed historical progression of soil staining and lagoon development at the site from 1965 through 1982.

A second site visit by WESTON personnel included the collection of local tax maps, a site walk-through to inspect suspected lagoon areas north of I-88, and the mapping of areas with stained soils. Tax maps indicated that the area in question north of I-88 has been owned by the family of the current site operator since at least 1955.

On 23 May 1990, WESTON presented its preliminary findings to the USEPA at a meeting in USEPA's New York offices. USEPA requested that WESTON gather additional data to support the expansion of the site boundary and the assumption that the additional lagoons and soil staining observed were directly due to Tri-Cities Barrel operations.

In response, WESTON conducted interviews with local residents, employees of the Broome County Department of Health, employees of the New York State Department of Health, and former

NYSDEC employees. In addition, WESTON acquired aerial photographs from the U.S. Geological Survey (USGS) for the years 1948 and 1958 in order to determine pre-operating and early site history.

As a result of this additional data collection and review, WESTON concluded that:

- Prior to the commencement of site operations in 1955, the area that is now owned by Tri-Cities Barrel was farmland which appears to have been a single farm. A local resident remembers the area as farm pasture with no ponds on the property
- In 1958, wastewater from Tri-Cities Barrel operations was discharged directly to the ground. There were no lagoons at this time for the collection of wastewater. A stained area of soils extending north approximately 700 to 800 feet to the property boundary is clearly evident in the 1958 aerial photograph
- A series of lagoons extending north from the process buildings were constructed in the early 1960s (confirmed by local residents)
- The area north of I-88 suspected of holding wastewater lagoons was described by one resident who used to hunt on this land as contaminated with a "blackish goo" in the 1960s

As a result of these and other confirming data, WESTON prepared the January 1991 Draft Work Plan (Revision No. 2) for RI/FS activities to include the approximately 13-acre area described herein.

ESC will validate the historical progression of soil staining and confirm the existence and use of all suspected lagoons to the extent possible by reviewing aerial photographs and site conditions, conducting interviews, and evaluating chemical data obtained during the remedial investigation described in this Work Plan (Revision No. 6). This Work Plan presents the steps to gather and analyze this information.

1.1 Overview of Problem

The Tri-Cities Barrel site is located approximately 5 miles northeast of Binghamton, adjacent to old Route 7, in the town of Fenton, Broome County, New York.

The Tri-Cities Barrel Company, operated by Mr. Gary Warner of Port Crane, New York, reconditioned and reclaimed used 55-gallon drums from 1955 to 1992. Between 1955 and the early 1960s, wastewater from the reconditioning process was discharged to the ground, and possibly into Osborne Creek. From the early 1960s to 1980, wastewater was discharged into unlined lagoons and allowed to evaporate, infiltrate, or spill over into surface water. Under a Consent Order with NYSDEC, the practice of discharging wastewater to the lagoons was discontinued and the three lagoons located south of I-88 were pumped out and backfilled in 1980. According to Mr. Gary Warner, a fourth, larger lagoon was constructed for temporary storage at that time. Until recently when reconditioning operations ceased, wastewater from the washing process was pumped into a holding tank and hauled offsite for disposal. According to Mr. Gary Warner during the July 1991 site visit, no wastewater was discharged to any lagoon north of I-88.

Wastewater potentially contaminated with the residual contents of the barrels may have seeped through the unlined lagoons and contaminated surrounding and underlying soils as well as the surface water and groundwater. Additionally, surface soil stains may be attributed to spillage of drum contents throughout the site. The residents of the area upgradient or crossgradient of the site are groundwater users.

There are no groundwater users directly downgradient of the Tri-Cities Barrel facility and no residences located between the facility and Osborne Creek.

Previous intrusive investigations were limited, consisting primarily of one round of sampling of four groundwater wells, and three sediment, surface water, and soil locations. A geophysical survey was conducted and seven domestic wells in the immediate vicinity were sampled. The data revealed that one shallow groundwater monitoring well contained low levels of all organics tested (<130 ug/l total) and surface soils in one location contained less than 150 ug/kg for all organics tested. No contamination was detected in surface water, stream sediments (except manganese was detected above the range of natural levels), the bedrock well, and the surrounding domestic wells. No measurements of volatile organics were detected above background in the ambient air. The geophysical survey identified three distinct anomaly patterns believed to be the locations of the former lagoons and did not detect any buried ferromagnetic material.

Potential sources of contamination include the abandoned wastewater disposal lagoons, reported presence of buried drums, alleged spillage from past drum handling operations, ash from the historical use of the onsite incinerator, and historical air emissions from the onsite incinerator and paint spray booth used in the barrel reclamation process. Contaminants may have entered the groundwater, surface water, soil, and air, potentially affecting drinking water supplies, humans (by way of ingestion or direct contact), plants, and animals. Insufficient documentation exists to confirm these potential sources of contamination, migration pathways, and potential receptors; therefore, they are addressed in this Work Plan.

1.2 Approach to Development of Work Plan

The technical scope of work for the RI/FS as well as a detailed schedule for the performance of the work are presented in this Work Plan.

This Work Plan presents a technical approach for the remedial investigation of the Tri-Cities Barrel site in accordance with the National Contingency Plan and USEPA guidance. Specifically, the National Oil and Hazardous Substance Pollution Contingency Plan (NCP) pursuant to 40 CFR 300.430(d)(1) states that "Site characterization may be conducted in one or more phases to focus sampling efforts and increase the efficiency of the investigation." OSWER Directive 9355.3-01 further states that "Field sampling should be phased so that the results of the initial sampling efforts can be used to refine plans developed during scoping to better focus subsequent sampling efforts. Data quality objectives are revised as appropriate based on an improved understanding of the site to facilitate a more efficient and accurate characterization of the site and, therefore, achieve reductions in time and cost." In addition, "Requirements of Third Party Cost Recovery Actions" (Subpart H, Section 300.700) requires that site investigation and remedial work be conducted in a cost-effective manner.

This Work Plan describes an approach which proceeds in a phased, logical manner that fully evaluates potential source areas and likely migration pathways. The investigation design relies on the use of existing and new data to plan each subsequent phase in order to adequately characterize the site. The intent of the Phase I investigation presented in the Work Plan is to characterize source areas, identify target compounds, characterize groundwater flow, determine and characterize the presence of contamination north of I-88, and determine the components of additional investigations. This approach is technically sound, cost-effective, consistent with the NCP, and will achieve the required schedule for completion. A cost estimate for implementation of the Phase I Remedial Investigation described in this

Work Plan is not necessary. The participating parties have the necessary financial resources available and have committed to conduct the RI/FS activities.

This Work Plan has been prepared in accordance with current USEPA regulations, policies, and guidance. Listed below are several of the documents specifically applicable to preparation of an RI/FS that were considered in preparing this Work Plan:

- Guidance on Remedial Investigation Under CERCLA (USEPA 1985)
- Guidance on Feasibility Studies Under CERCLA (USEPA 1985a)
- Draft Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA (USEPA 1988)
- Data Quality Objectives: Development Guidance for Uncontrolled Hazardous Waste Site Remedial Response Activities (USEPA 1986)
- Interim Guidance of Superfund Selection of Remedy (USEPA 1986a)
- Additional Interim Guidance for FY-87 Records of Decision (USEPA 1987)
- Applicable OSWER directives
- Risk Assessment Guidance for Superfund - Human Health Evaluation Manual (USEPA 1989)
- Risk Assessment Guidance for Superfund - Environmental Evaluation Manual (USEPA 1989)
- National Oil and Hazardous Substances Pollution Contingency Plan; Final Rule (USEPA 1990)

- New York State Department of Environmental Conservation, Division of Fish and Wildlife, Sediment Criteria Document (NYSDEC 1989)
- New York State Department of Environmental Conservation, Division of Fish and Wildlife, Draft Fish and Wildlife Impact Analysis for Inactive Hazardous Waste Sites (NYSDEC 1991)
- New York State Department of Environmental Conservation, Division of Water, Water Quality Regulations for Surface Waters and Groundwater (NYSDEC 1991).

Preparation of the Work Plan was based on a review and consideration of data, information, and discussions related to the following:

- USEPA files
- NYSDEC files
- USGS sources
- Site visit reports
- July 2, 1991, site visit and interview of Mr. Gary Warner by ESC and several participating parties
- July 25, 1991, meeting with USEPA, including representatives of USEPA Region II, Ashland Chemical, Inc., Nixon, Hargrave, Devans & Doyle, and ESC

- July 30, 1992, meeting with USEPA, including representatives of USEPA Region II, Roy F. Weston, NYSDEC, Ashland Chemical, Inc., International Business Machines Corporation, and ESC
- October 16, 1992, site visit and interview of Mr. Gary Warner by ESC.

1.3 Work Plan Content

This Work Plan contains the following ten sections:

- Section 1: Introduction
- Section 2: Site Background and Setting (location, history, and conditions at the site)
- Section 3: Initial Evaluation of Existing Data (describes types of wastes present, site hydrogeology, the potential migration and exposure pathways, a preliminary assessment of public health and environmental impacts, a preliminary identification of applicable or relevant and appropriate requirements (ARARs), and preliminary remedial action objectives)
- Section 4: Work Plan Rationale (data quality objectives for RI sampling activities and approach for preparing the Work Plan that illustrate how the activities will satisfy data needs.)
- Section 5: RI/FS Scope of Work (includes discussion of each RI/FS task in accordance with the "Interim Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA", October 1988, OSWER Directive 9355.3-01)
- Section 6: Schedule

- Section 7: Project Management Approach
- Section 8: Staffing Plan
- Section 9: References
- Section 10: Glossary of Abbreviations

2.0 Site Background and Setting

2.1 Site Location and Description

The Tri-Cities Barrel site is located approximately 5 miles northeast of Binghamton, adjacent to Old Route 7, in the town of Fenton, Broome County, New York. I-88 borders the former operating site to the north; the remainder of the 3.5-acre former operating site is bordered by rural residential areas and farmlands. The site location and site layout are presented in Figures 2-1 and 2-2, respectively. The former operating site consists of a process building, a garage, an incinerator, two large aboveground oil storage tanks, and numerous piles of unprocessed drums. The site is not secured by perimeter fencing; access is presently uncontrolled. The surface of the site that is south of I-88 is relatively flat. In the vicinity of I-88, the ground surface slopes down steeply to the north. Approximately 10 additional acres owned by Tri-Cities Barrel are located north of I-88, extending north to Osborne Creek.

A stream is located on the eastern edge of the site. Additionally, a small, seasonal stream drains the western half of the site (see Figure 2-2). Both features flow to the north, eventually reaching Osborne Creek, which drains to the west into the Chenango River. The site is also spotted with many small areas of ponded, stagnant water. Discoloration of the water was observed in several of these puddles (Engineering-Science/Dames & Moore (ES/D&M) site visit, 1985; WESTON site visit, May 1990). According to NYSDEC, the nearest registered wetland is approximately 3 miles northeast of the site (Cotterill November 14, 1985).

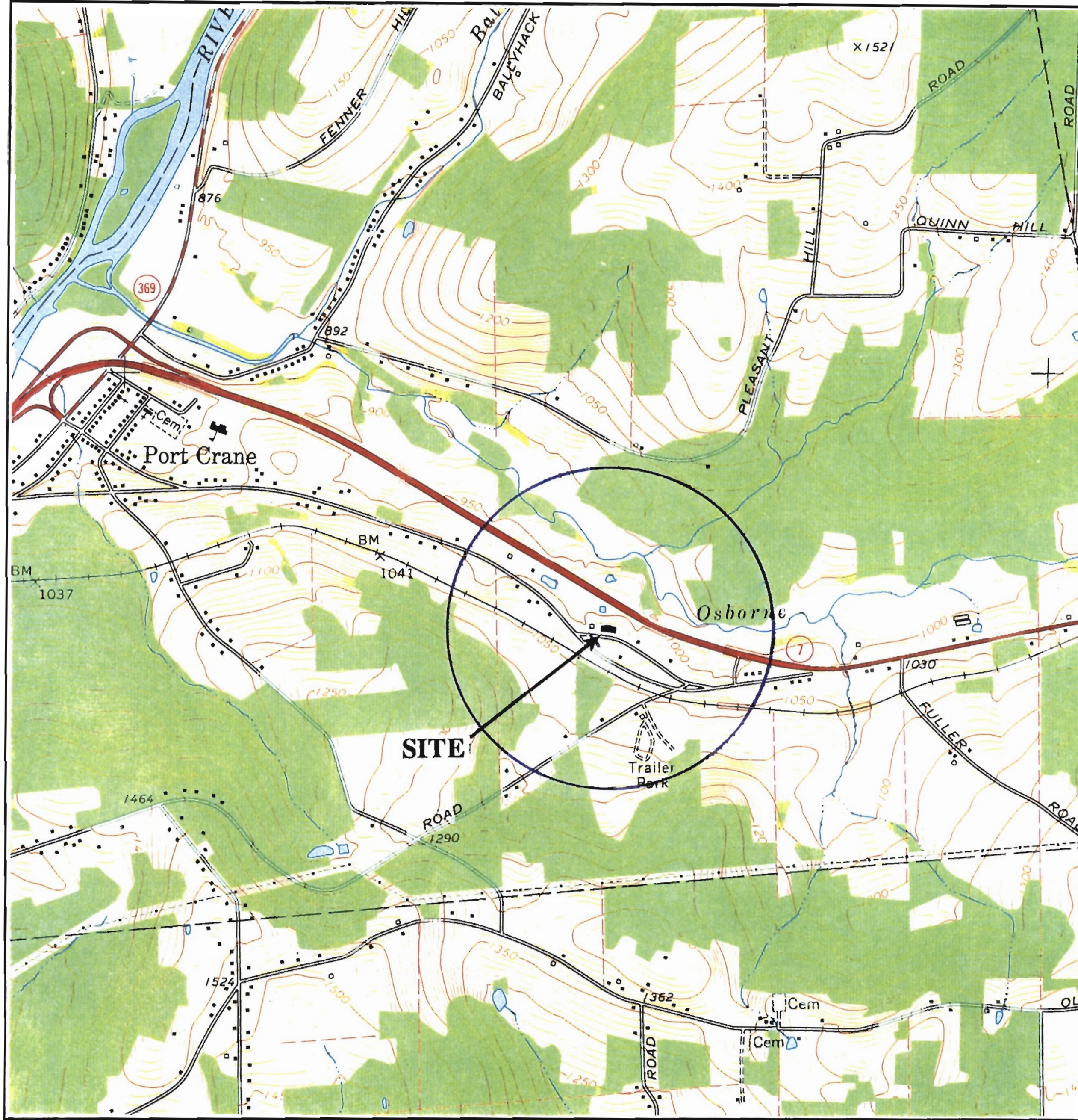
N

CHENANGO FORKS QUADRANGLE

NEW YORK - BROOME COUNTY

7.5 MINUTE SERIES (TOPOGRAPHIC)

Photorevised 1968



1 ½ 0 1 Mile

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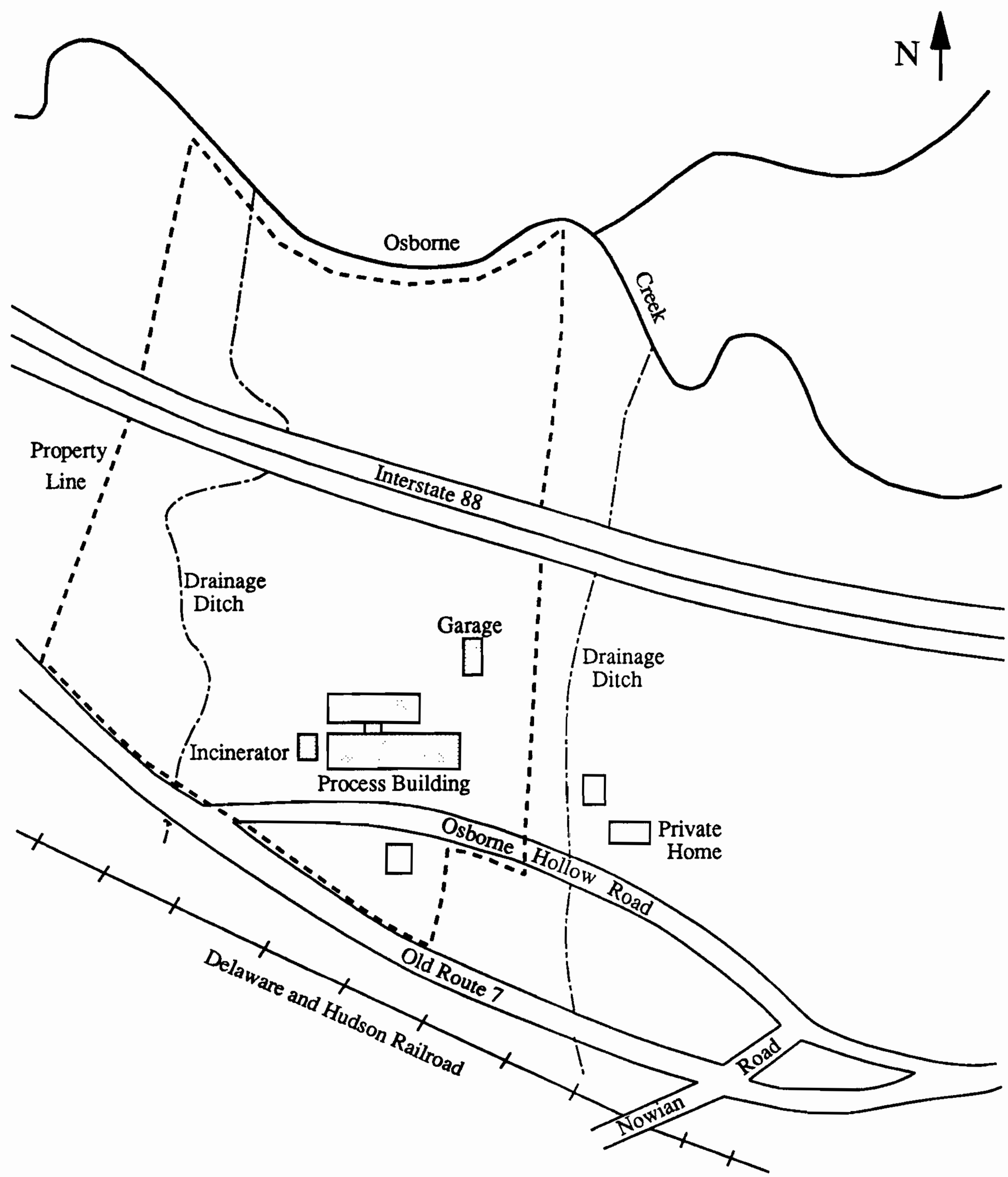
Figure 2-1

Location of the Tri-Cities Barrel Site in Fenton, New York



Adapted from the WESTON Workplan Figure 2-2

Not to Scale

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Figure 2-2
Site Layout
Tri-Cities Barrel Site
Fenton, New York

2.2 Site History

The site operated as a barrel reclamation facility from 1955 to 1992. Aerial photographs from 1948 show that the site was originally a farm. As reported in the WESTON Work Plan, no ponds are evident in the 1948 photographs. Reclamation operations are no longer conducted at the facility. The operator is Mr. Gary Warner of Port Crane, New York, who is currently using the site to assemble and reform clean drums at the site.

The drum reclamation process involved cleaning the interior of the barrels with a combination of physical/chemical/mechanical means, including incineration of adhered material on drum interior, particle blasting, scraping by rolling barrels with chains inside and rinsing with a 10 percent sodium hydroxide solution and repainting. The wastewater generated in the cleaning process was originally discharged to the ground, then for a time to unlined "evaporation" lagoons, and recently was collected in a holding tank and hauled offsite for disposal. Additional information will be sought on the historical discharge of wastewater.

The WESTON Work Plan reports that local soils contain a "large portion of sand and gravel" and that "it is believed that infiltration from the lagoons into the soils as well as evaporation occurred." The extent of infiltration is currently unknown and may have been limited if the shallow soils have a lower permeability than the sand and gravel reported in the WESTON Work Plan. The extent of infiltration will be determined during the remedial investigation.

The WESTON Work Plan reported that according to the owner, prior to 1980 three unlined lagoons, connected in series, processed wastewater. The first of the three lagoons acted as an oil and water separator, the second lagoon received the sodium hydroxide solution, and the third contained rinsewater. These lagoons were reportedly 3 to 4 feet deep.

In addition to the three lagoons reported by the owner, WESTON identified the presence of a series of bermed, water-filled depressions which are evident in aerial photographs dating back to 1965. The WESTON Work Plan indicated that these depressions served as lagoons. These depressions also appear on the NYSDOT I-88 pre-construction map. The WESTON Work Plan reported that according to local residents, these early depressions were built in the early 1960s; prior to this, wastewater was discharged directly to the ground, where some infiltrated and some ran into Osborne Creek (see the 1958 aerial photo at the end of this section and Figure 2-3) along natural drainage pathways. The extent of infiltration and discharge to Osborne Creek has not been determined. These water-filled depressions ran in a relatively straight line from the process building north towards Osborne Creek (as shown in Figure 2-4). The suspected lagoon locations identified by WESTON in Figure 2-4 are referenced by the date of the aerial photograph used for identification. Since they were located on a downgradient slope from the process building, they were interconnected and gravity fed. Reportedly, at least one of these lagoons was excavated during construction of I-88.

According to WESTON, a 1968 aerial photograph shows I-88 under construction. WESTON identified two lagoons onsite, the westernmost lagoon mapped by NYSDOT in 1967 and a new lagoon that had been constructed farther to the west. With the exception of the northernmost lagoon near Osborne Creek, all other lagoons formerly located north of the process building are no longer present. The 1973 aerial photograph shows three lagoons in operation. Under a Consent Order with NYSDEC, in 1980 these lagoons were pumped out and backfilled with approximately 7,000 cubic yards of fill from property (quarry) owned by Francis Warner. A site visit by WESTON confirmed that material from this quarry is glacial drift (clay, silt, and gravel). During closure of the lagoons, Gary Warner stated that a fourth, "larger" lagoon was constructed. According to WESTON, the berms of this lagoon were still evident

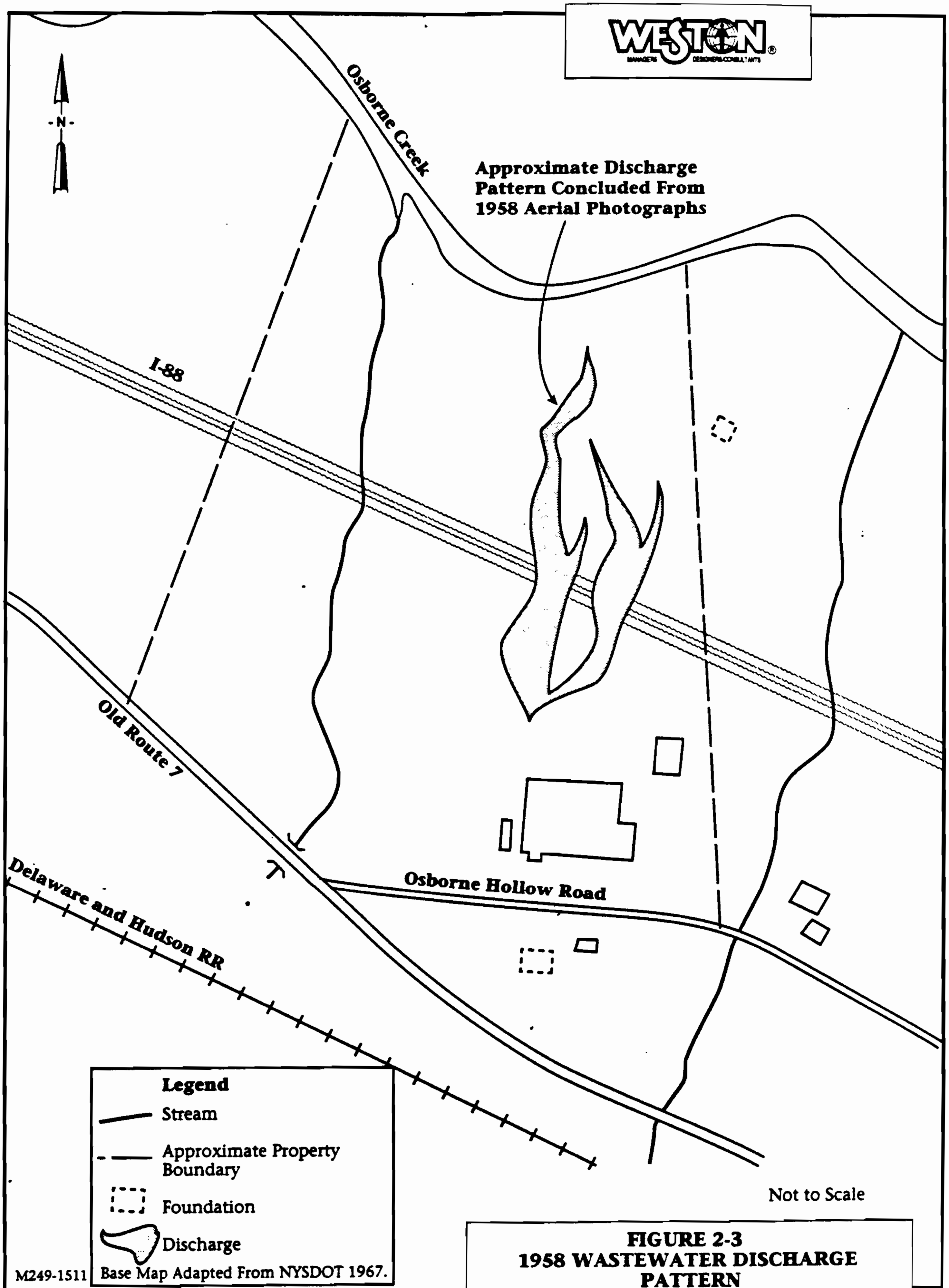
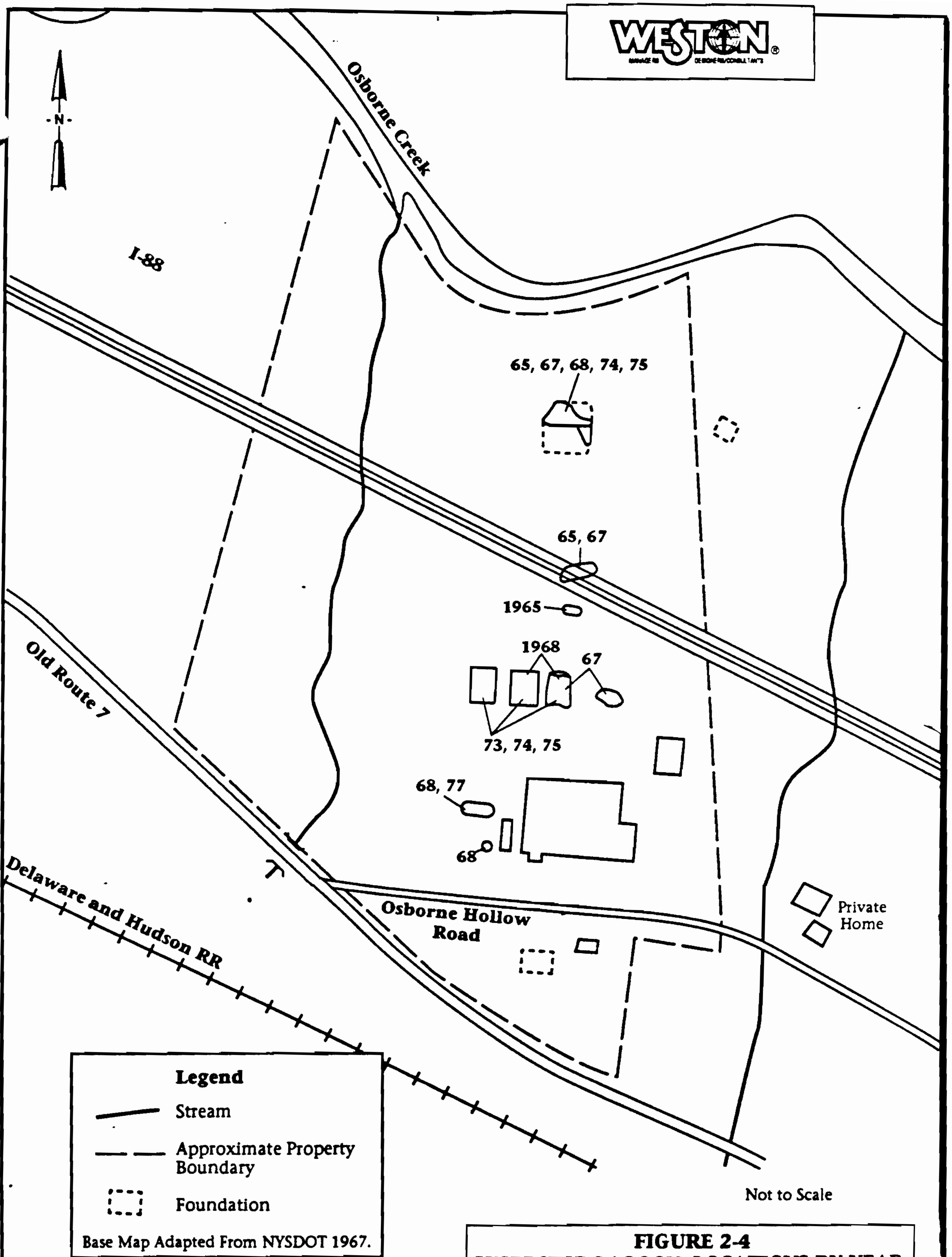


FIGURE 2-3
1958 WASTEWATER DISCHARGE PATTERN



251-1532

FIGURE 2-4
SUSPECTED LAGOON LOCATIONS BY YEAR
TRI-CITIES BARREL SITE

during the 9 May 1990 site visit. The berms were not evident during the 2 July 1991 visit. The past use of this lagoon is unknown. During an October 16, 1992 site visit, Mr. Warner stated that a 3,000-gallon, in-ground, open top, rectangular tank was located south of I-88 and adjacent to the three lagoons and was used temporarily during the closure of the three lagoons. Once the closed-loop wastewater treatment system was installed, this tank was no longer used and was removed from the ground. This in-ground tank may be the fourth lagoon. This information will be confirmed during the RI.

The 1968 aerial photograph also shows two water-filled depressions west of the process buildings. The southern, smaller depression appears to be connected to the building by a pipe or chute. In the 1973 aerial photographs, the southern depression is gone, and the incinerator has been built. The northern depression is still in existence in 1977. Based on historical evidence from the aerial photographs, The WESTON Work Plan reported that up to nine lagoons appear to have been used between the early 1960s and 1980. The existence of these lagoons or depressions may be evident in the aerial photographs, but their use cannot be determined without further investigation.

Over the years, reportedly "clean" fill material from a quarry south of Old Route 7 has been used to fill in the ponds and build up the yard area north of the main process building for storage and operations. The original ground surface is 4 to 8 feet below the current ground surface (G. Warner, November 1985 and Engineering-Science in Association with Dames and Moore Phase II boring logs). The WESTON Work Plan reported that, buried drums were exposed at depths of 4 to 6 feet along the northern and western slopes of the site. These drums may have been buried when the yard was built up. These drums were not readily evident during the 2 July 1991 site visit, but drum lids and bung caps were.

According to the WESTON Work Plan, the aerial photographs dating back to 1965 show that virtually all areas of the property south of I-88 have been used for the storage of drums. The approximate boundaries of these former drum storage areas are shown in Figure 2-5. In the WESTON Work Plan, it is noted that prior to the construction of I-88 in 1970, interpretation of aerial photographs identified areas of disturbed or stained soils, presumably resulting from past operations. These areas are shown in Figure 2-6 as shaded areas.

It is stated in the WESTON Work Plan that there is evidence that drum storage areas and former lagoons have extended beyond the 3.5-acre site boundaries of the former operating site (Figure 2-7) as described in the New York State Phase II Engineering Investigations report prepared by Engineering-Science in association with Dames and Moore. The investigation described in this Work Plan includes an investigation of the 3.5 acres of the former operating site and the additional 10 acres located north of I-88. The area north of I-88 will be investigated to assess if the water filled depression located north of I-88 was used as a lagoon associated with facility operations and to determine if the discharge of wastewater to the ground in the 1950s affected this area.

An incinerator was also used at this site for the incineration of flammable solids such as dried paint residues and polymerized plastics found adhered to the insides of open-topped drums (G. Warner 1983). The ash produced in this process was packaged and shipped offsite as hazardous waste for disposal (G. Warner 1983). Ash had also been spilled on the ground in the vicinity of the incinerator (Alden 1986).

A Phase I investigation for NYSDEC was conducted at this site by Engineering-Science in conjunction with Dames & Moore in June 1983. The data from the Phase I report were evaluated for determining a Hazard Ranking Score (HRS) and were found to be insufficient. A Phase II investigation was conducted at the Tri-Cities Barrel site from August to December 1985 to provide additional geophysical data and groundwater, surface water, soil, sediment, and air contamination data. Data from

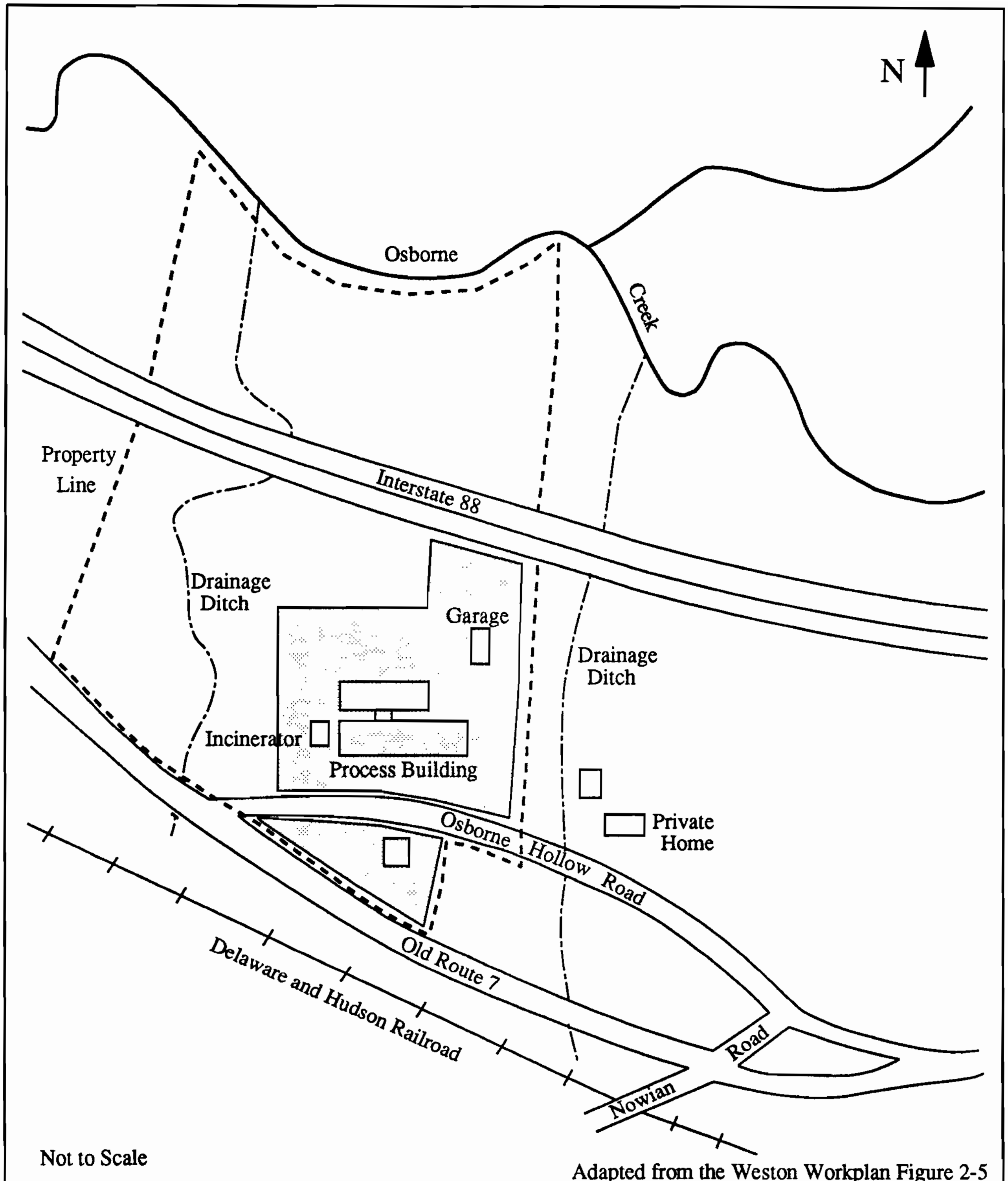


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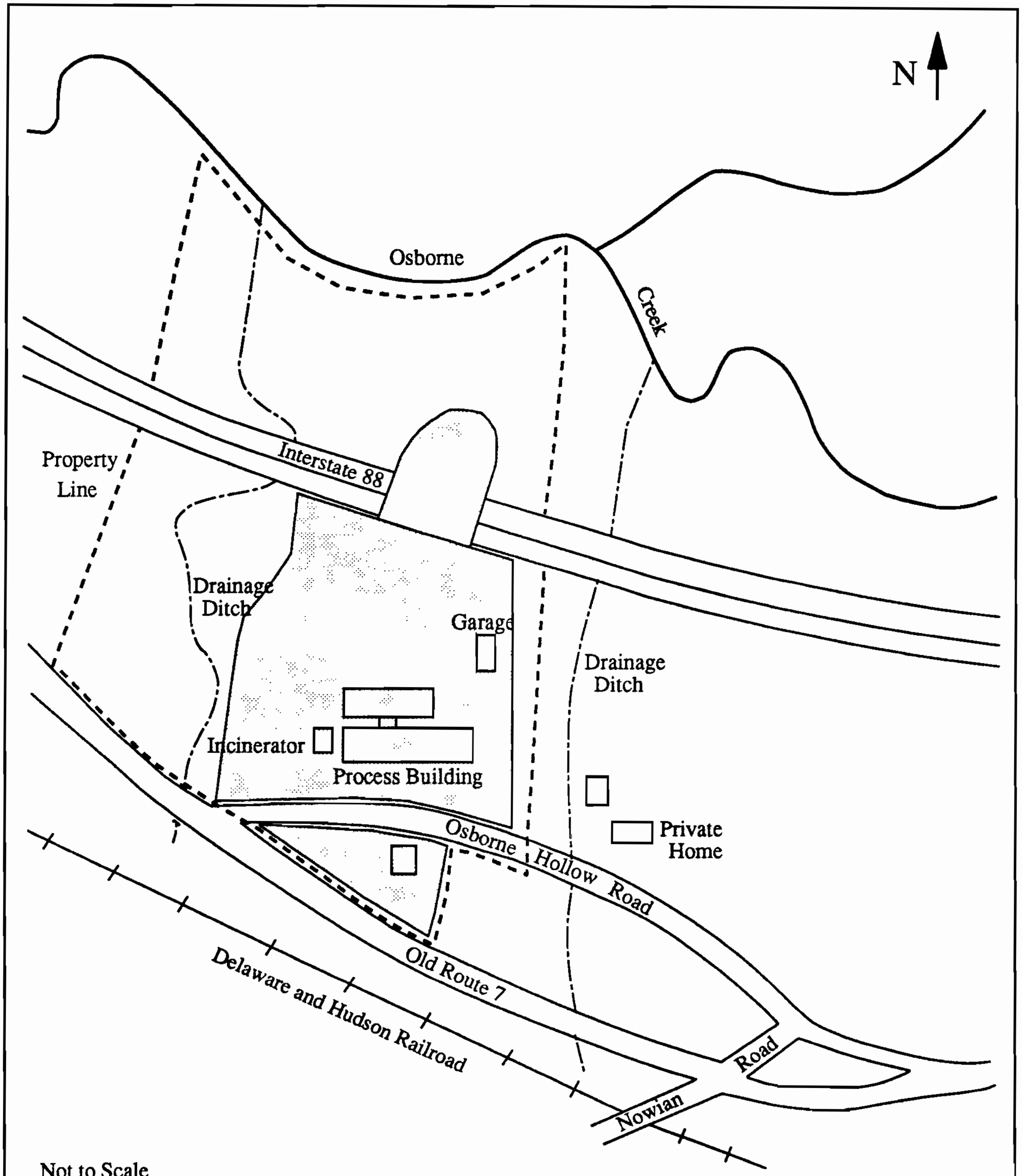
Figure 2-5
Former Drum Storage Areas
Tri-Cities Barrel Site, Fenton, New York



Adapted from WESTON Workplan Figure 2-6

ENVIRONMENTAL STRATEGIES CORPORATION Four Penn Center West • Suite 315 Pittsburgh, Pennsylvania 15276 (412) 787-5100	Figure 2-6 Former Areas of Stained or Disturbed Soil Tri-Cities Barrel Site, Fenton, New York

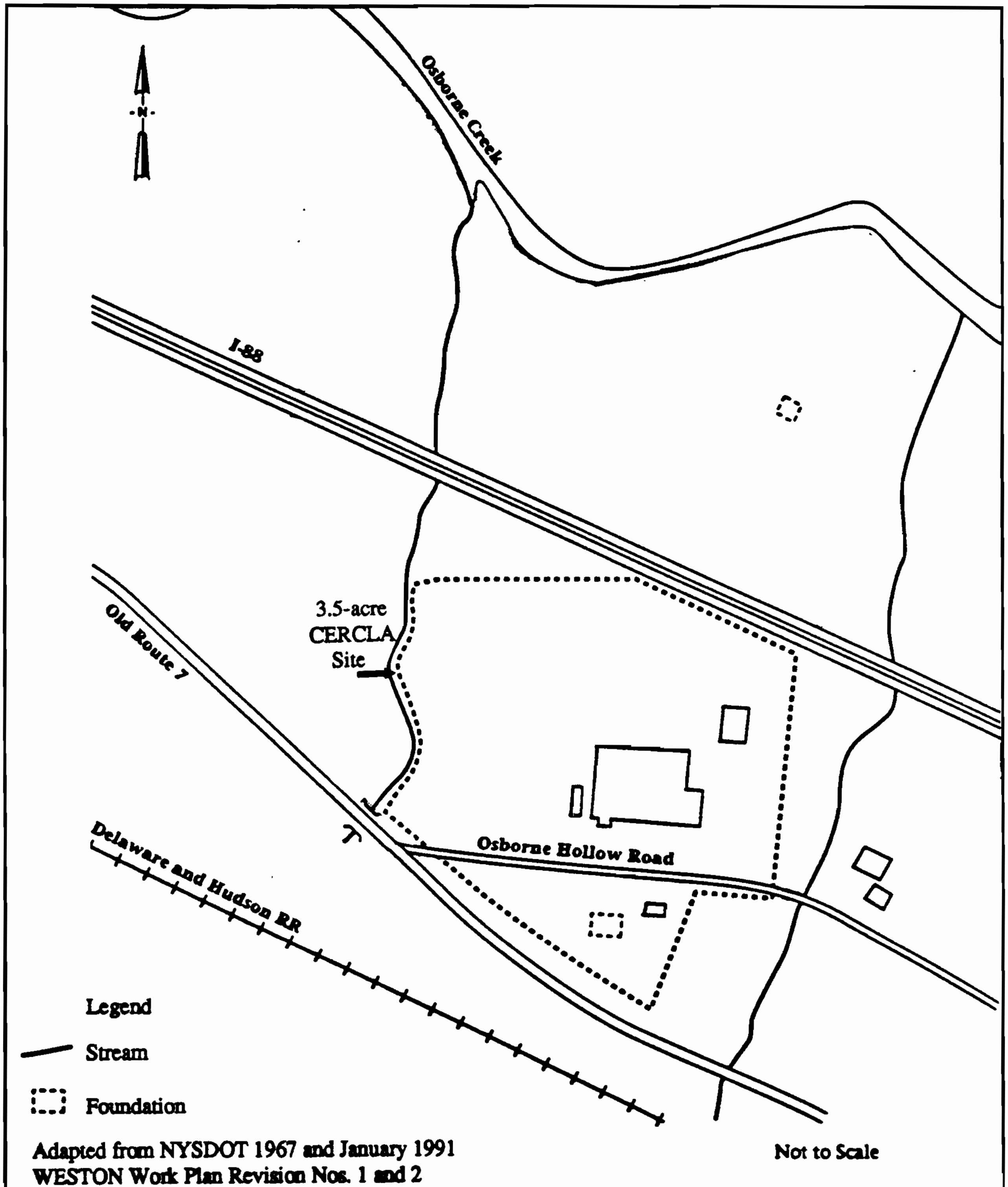


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Figure 2-7

Approximate Boundaries of the Former Operating Site, Tri-Cities Barrel Site, Fenton, New York the Phase II report, combined with Phase I data, resulted in an HRS of 48.33, and subsequent listing of the site on the NPL.

In the Phase II investigation, surface water, sediment, and soil samples were collected and analyzed for organics and metals. Concentrations of substances found in site media are fully documented later in Tables 3-3, 3-4, 3-5, 3-7, and 3-8. Groundwater samples were collected and analyzed for organics only. These results indicated that one of the four groundwater samples had concentrations of Aroclor 1242 (2.9 ug/l) and chlordane (3.8 ug/l) above NYSDEC groundwater standards. As stated in the WESTON Work Plan, pesticides and PCBs are relatively insoluble; therefore, it was concluded that when levels occur in groundwater, soils are probably contaminated. It should be noted that pesticides and PCBs were below detection in the soil samples that were collected. A soil sample collected from an auger hole located in an area of "clean" fill had concentrations of several organic compounds. WESTON concluded that this suggests that drum handling operations have contaminated the fill. No soil samples were taken of materials below the fill during the Phase I and Phase II investigations. Therefore, the migration of contaminants into underlying soils or groundwater from these potential sources has not been determined. Surface water or sediment samples collected during the Phase II investigation did not show any contamination.

No remedial or enforcement measures have been taken other than the NYSDEC Consent Order requiring the emptying and backfilling of the onsite lagoons in 1980. USEPA Region II placed the site on the NPL in October 1989. This RI/FS is being conducted under CERCLA (Superfund). Figure 2-8 shows the present and former Tri-Cities Barrel properties.

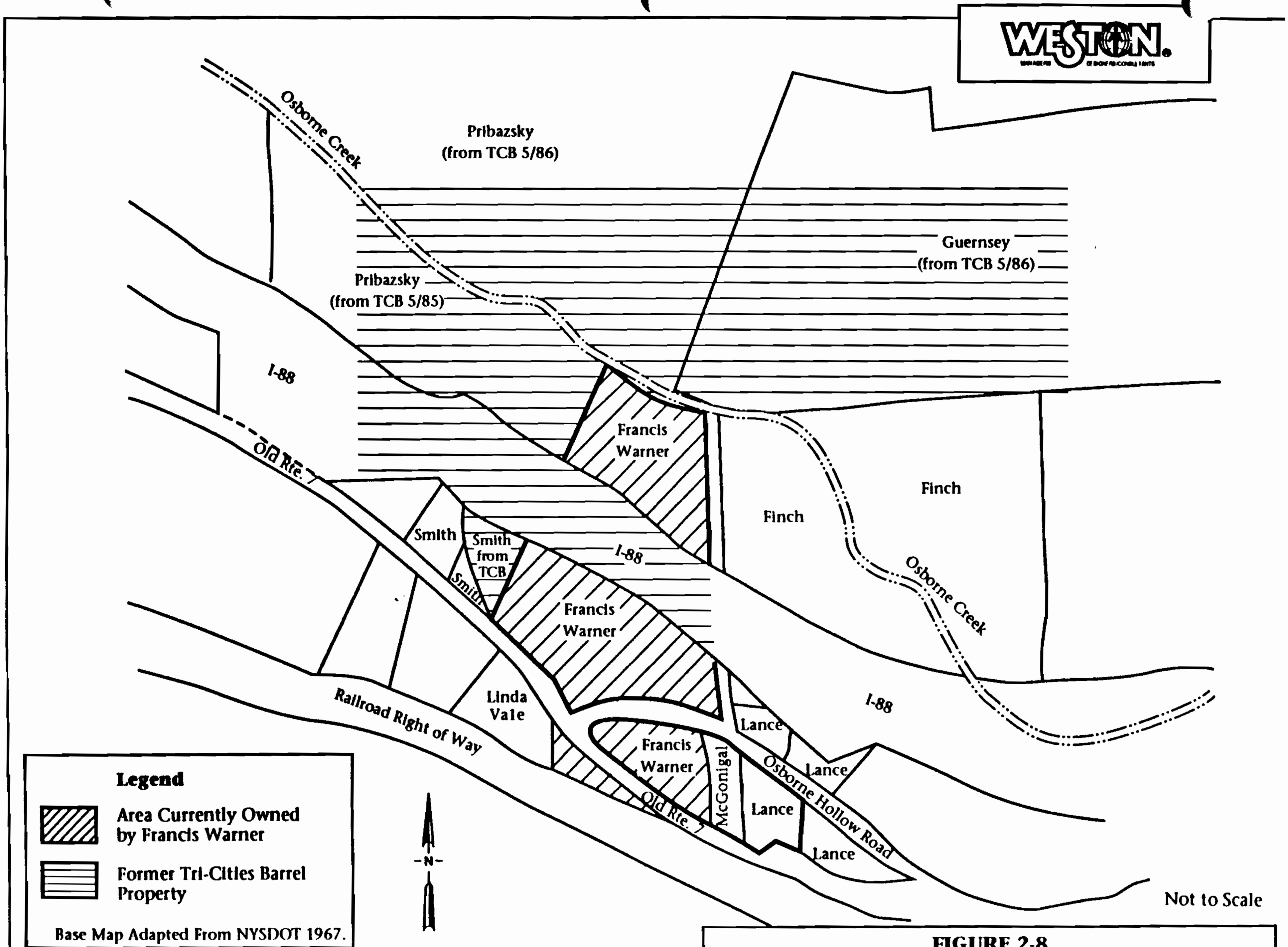
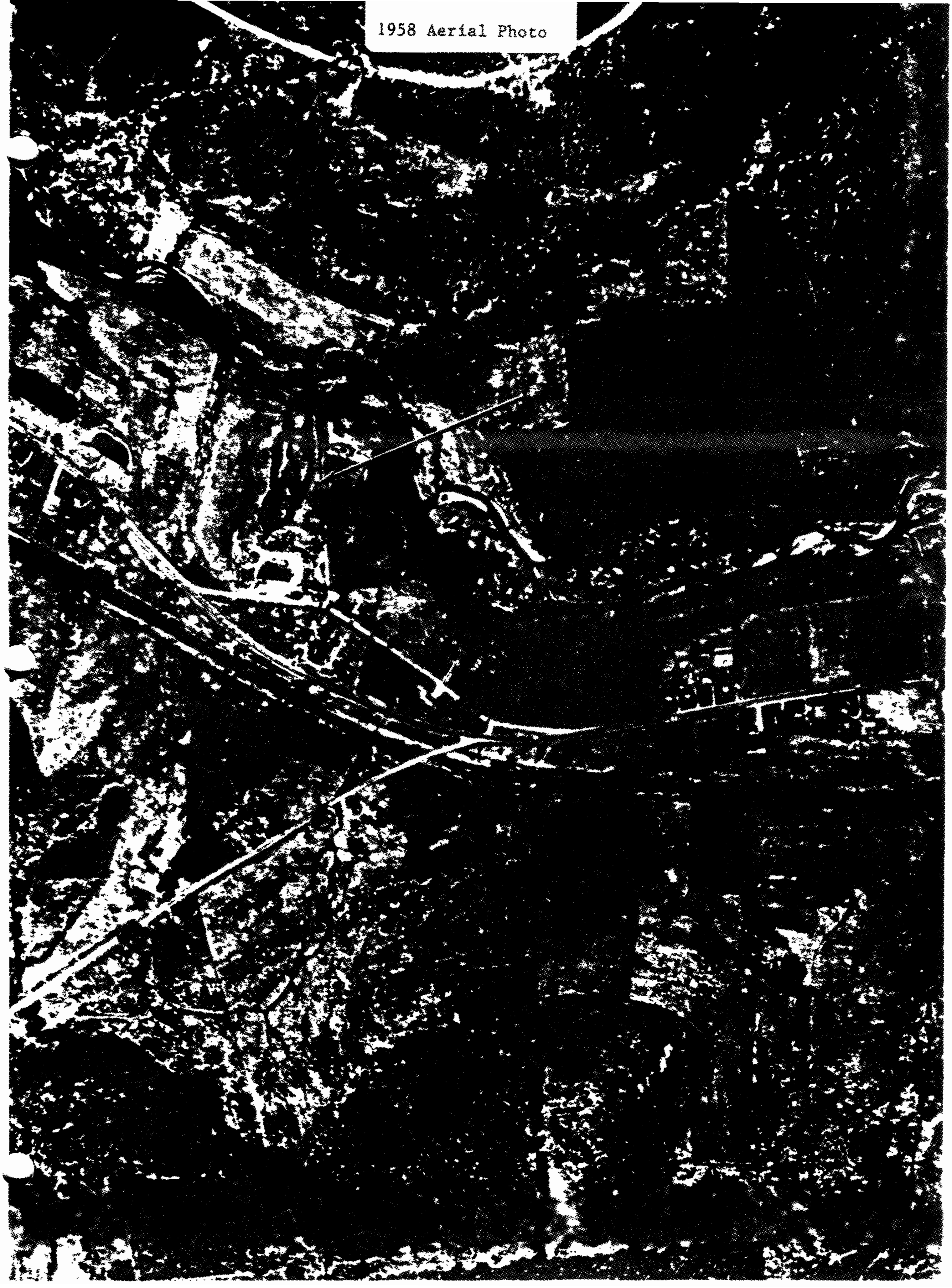


FIGURE 2-8
CURRENT AND HISTORICAL PROPERTY OWNERSHIP
TRI-CITIES BARREL SITE

78-584

2.3 Current Conditions

Tri-Cities Barrel currently assembles and reforms clean drums at the site. These activities include decapitating the tops of bung drums, adding a third hoop in drums, assembling drums, and painting drums. Reclamation operations ceased at the facility in the spring of 1992. The facility has a USEPA ID Number (NYD002245264) pursuant to RCRA.


1958 Aerial Photo

3.0 Initial Evaluation of Existing Data

3.1 Review of Existing Data

This evaluation of the existing data is based on a review performed by WESTON and presented in the WESTON Draft Work Plan.

3.1.1 Drainage and Surface Waters

Broome County is in the Susquehanna Hills section of the Appalachian Uplands. This area is a dissected plateau with flat-topped hills and narrow valleys and is drained by the Chenango River, a tributary of the Susquehanna River. The drainage pattern is arcuate to trellis (Figure 3-1), perhaps due to the subtle influence of low amplitude folding of the bedrock units.

The Tri-Cities Barrel site is located south of Osborne Creek. Two small unnamed seasonal streams, one on the eastern edge and one on the western edge of the site, receive runoff from the site. These streams flow into Osborne Creek. Reportedly, Osborne Creek has been dredged and the dredged material placed on the banks of the creek. However, it is unknown whether the portion of Osborne Creek that borders the site has ever been dredged. Osborne Creek joins the Chenango River at Port Crane, approximately 1.3 miles west of the site. The Chenango River joins the Susquehanna River at Binghamton, New York.

The WESTON Work Plan reports that one lagoon still exists between I-88 and Osborne Creek. It is further reported that this lagoon is manmade, with obvious berms along its eastern and southern edges. The WESTON Work Plan reports that overflow from the lagoon flows to Osborne Creek during times of high water and that this was the northern-most lagoon in the series of lagoons shown on the historical aerial photographs (Figure 2-4). ESC does not believe that the historical use of this feature is

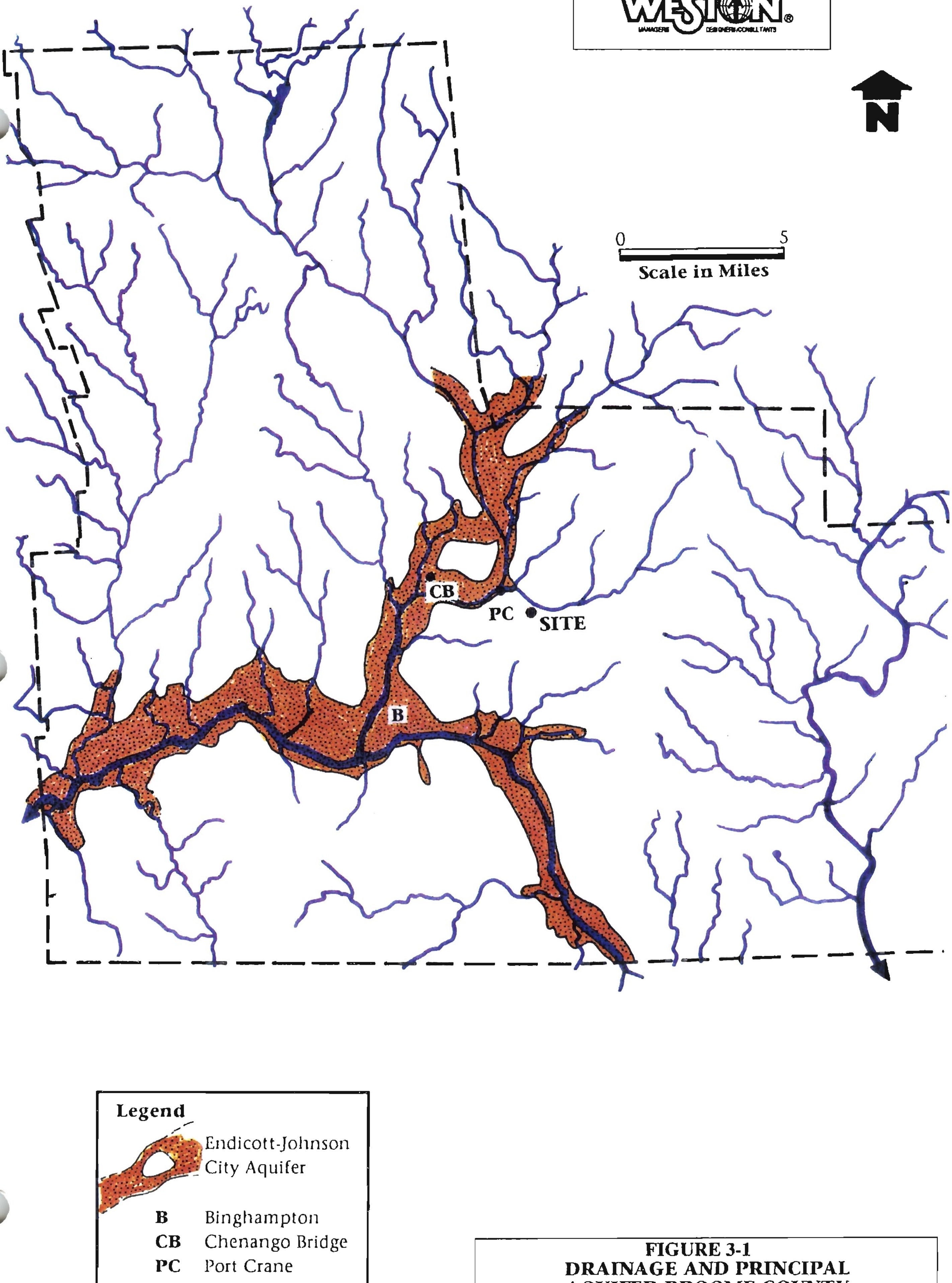


FIGURE 3-1
DRAINAGE AND PRINCIPAL AQUIFER-BROOME COUNTY
TRI CITIES BARREL

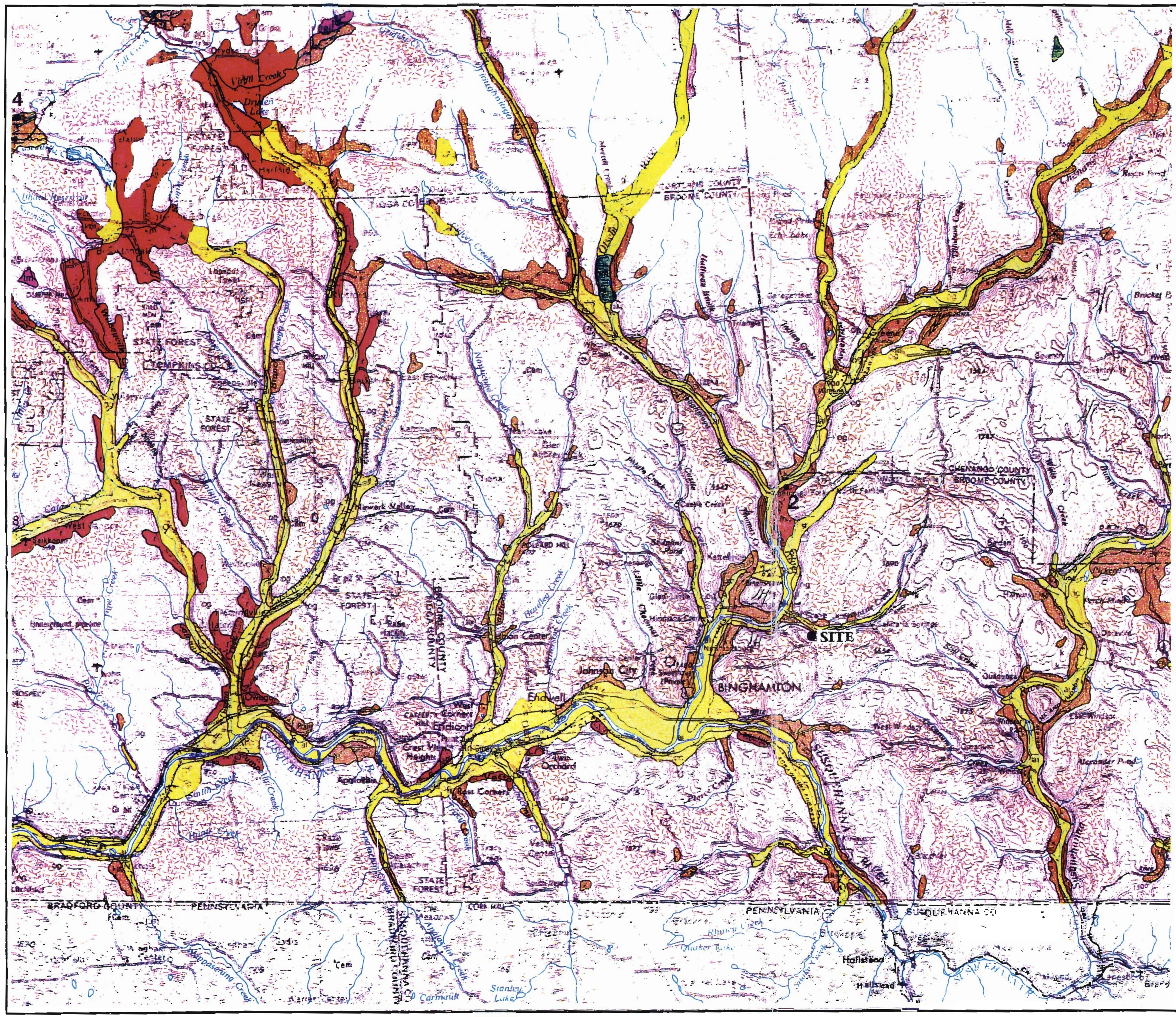
clearly defined and is proposing that further investigation be conducted to assess if it was used as a lagoon associated with the facility operations. The location of the lagoon does not lend itself to easy access from the facility and, as indicated by Mr. Warner, the facility had no need to construct a lagoon in that area. The chemical constituents of the soil, surface water, and sediments associated with this feature need to be determined before any additional conclusions are formed regarding its historical use.

3.1.2 Hydrogeologic Characteristics

3.1.2.1 Regional Geology. The Tri-Cities Barrel site, in the Susquehanna Hills section of the Appalachian Uplands, is located in an area characterized as a dissected ancient erosion surface, uplifted during the Cenozoic, with flat-topped hills and narrow valleys. The topography of the hills is controlled by relative resistance to erosion and the structural dip of the bedrock. Gentle, southerly dipping units of siltstone, sandstone, and shale control the form of the asymmetric hills. Northern faces are steep, the gentler southern faces are dipslopes. Valleys are formed in zones of less resistant shale or along closely-spaced joint sets.

Local relief is typically expressed in hundreds of feet. Regional slopes generally range from 9 to 18 percent. The site is in an area that has "excessive slopes" (greater than 10 percent; Cressey 1966).

As reported in the WESTON Work Plan, the surficial deposits of eastern Broome County are predominantly till on the hillsides and tops and outwash in the larger valleys (see Figure 3-2). Alluvium lies along the floors of the smaller valleys. Kame terraces occur along the valley walls of Osborne Creek and the Chenango River. Economically viable deposits of sand and gravel have been mined from the outwash in the valley floors of this area. Based on the aerial photographs, WESTON reported that many gravel pits were active during the construction of I-88.



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all alluvial fan

pm Swamp deposits
Peat-muck, organic silt and sand in poorly drained areas,
unoxidized,
may be overlying marl and lake silts,
potential land instability,
thickness generally 2-20 meters

ls Lacustrine sand
Sand deposits associated with large bodies of water,
generally a near-shore deposit or near a sand source,
well-sorted, stratified,
generally quartz sand,
thickness variable (2-20 meters)

og Outwash sand and gravel
Coarse to fine gravel with sand,
proglacial fluvial deposition,
well-rounded and stratified,
generally finer texture away from ice border,
thickness variable (2-20 meters).

k - Kame deposits
Includes kames, eskers, kame terraces, kame deltas,
coarse to fine gravel and/or sand,
deposition adjacent to ice,
lateral variability in sorting, coarseness and thickness,
locally firmly cemented with calcareous cement,
thickness variable (10-30 meters)

km - Kame moraine
Variable texture (size and sorting) from boulders to sand,
deposition at an ice margin during deglaciation,
locally cemented with calcareous cement,
thickness variable (10-30 meters).

tm Till moraine
Much like till, but more variable in sorting,
generally more permeable than till,
deposition adjacent to ice,
more variably drained,
may be ablation till,
thickness variable (10-30 meters)

t - Till
Variable texture (e.g. clay, silt-clay, boulder clay),
usually poorly sorted diamict,
deposition beneath glacier ice,
generally calcareous in northern part of map,
relatively impermeable (loamy matrix),
variable clast content – ranging from abundant well-rounded diverse lithologies in valley tills to relatively angular, more limited lithologies in upland tills,
potential land instability on steep slopes,
thickness variable (1-50 meters).

r - Bedrock
Exposed or within 1 meter of surface,
the following types of rock may be exposed:
Paleozoic limestone, sandstone, shale.

Bedrock stipple overprint
bedrock may be within 1-3 meters of surface,
may sporadically crop out,
variable mantle of rock debris and glacial till

N

0 200 400 600
Scale in Feet

FIGURE 3-2
REGIONAL SURFICIAL GEOLOGY
TRI-CITIES BARREL

3.1.2.1.1 Bedrock Geology. Broome County is underlain by marine siltstones and shales of the Upper Devonian Sonyea Group (Figure 3-3). The base of the Sonyea Group is comprised of the black shale of the Middlesex or Montour Shales, grading up into the Sawmill Creek Shale. These shales grade upwards into either the Rock Stream Siltstone and Polteney Shale or the greenish-gray Cashaqua Shale (Dugolinsky 1981). The Sonyea Group was deposited in a shallow sea as distal muds of the Catskill Delta (Karig and Elkins 1986). It is approximately 450 feet (130 m) thick and is part of an 8,000-foot (2,400 m) thick sequence of lower and middle Paleozoic sedimentary rocks that overlie granitic Precambrian basement (Karig and Elkins 1986).

3.1.2.1.2 Structure. The structure of the area is relatively simple. The rocks form a large regional homocline that dips southward 10 to 50 feet/mile (Bloom 1986; Coates 1981). The homocline is mildly deformed by gentle, asymmetric, regional, east-west trending folds with steep south limbs. The amplitude of the folds is approximately 330 feet (100 m) and their wavelength is approximately 6 miles (10 km). The east-west striking axis of the Horseheads Syncline lies south of the site. This structure does not extend below a decollement in the Silurian salt beds some 3,500 feet (1060 m) below the ground surface (Karig and Elkins 1986).

3.1.2.1.3 Glacial Geology. Broome County is a transition area between the rugged relief of the Catskill Mountains and the dissected plateau to the west (Coates 1981).

The area is characterized by numerous umlaufbergs, or bedrock outliers in the valley bottom. The umlaufbergs are bedrock hills that are surrounded by thick deposits of alluvium or outwash. They were formed when glacial meltwaters scoured a deep notch into a valley spur. An umlaufberg lies at Chenango Bridge, 2 miles (3 km) west of the site. The Chenango River valley contains a thick (>60 foot (20 m)) section of stratified glacial deposits, including outwash underlain by lacustrine silt and clay. The outwash

WEST FALLS GROUP
1100-1600 ft. (340-490 m.)

Dwn	Nunda Formation—sandstone, shale.
Dwg	West Hill and Gardeau Formations—shale, siltstone; Roricks Glen Shale; upper Beers Hill Shale; Grimes Siltstone.
Dwr	lower Beers Hill Shale; Dunn Hill, Millport, and Moreland Shales.
Dwc	Nunda Formation—sandstone, shale; West Hill Formation—shale, siltstone; Corning Shale.
Dwnm	"New Milford" Formation—sandstone, shale.
Dwrg	Gardeau Formation—shale,. siltstone; Roricks Glen Shale.
Dws	Slide Mountain Formation—sandstone, shale, conglomerate.
Dwm	Beers Hill Shale; Grimes Siltstone; Dunn Hill, Millport, and Moreland Shales

SONYEA GROUP
200-1000 ft. (60-300 m.)

Ds	In west: Cashaqua and Middlesex Shales. In east: Rye Point Shale; Rock Stream ("Enfield") Siltstone; Pulteney, Sawmill Creek, Johns Creek, and Montour Shales.

GENESEE GROUP AND TULLY LIMESTONE
200-1000 ft. (60-300 m.)

Dg	West River Shale; Genundewa Limestone; Penn Yan and Geneseo Shales; all except Geneseo replaced eastwardly by Ithaca Formation—shale, siltstone and Sherburne Siltstone.
Dgo	Oneonta Formation—shale, sandstone.
Dgu	Unadilla Formation—shale, siltstone.
Dt	Tully Limestone.

0 200 400 600
Scale in Feet

FIGURE 3-3
REGIONAL BEDROCK GEOLOGY
TRI CITIES BARREL

and lake deposits overlie ice-contact sand and gravel (subaqueous outwash) and are interbedded with valleyside kames (Coates 1981; Holecek 1982).

The region was glaciated four to ten times (Bloom 1986). Each time, the glaciers scoured away weathered material and most of the deposits from the previous glaciations. Thus, deep soil profiles and pre-Wisconsinan glacial deposits are rare. Glacial scour was far more effective in the pre-existing valleys than on the nearby hill tops. As reported in the WESTON Work Plan, the valleys were over-deepened and scoured into U-shaped cross-sections while only a relatively small amount of erosion and glacial streamlining took place on the ridges.

Valley orientation controlled the intensity of glacial erosion. Valleys that were parallel to the ice flow, such as the Chenango Valley, were deeply eroded. Valleys that were not oriented parallel to the glacial movement, such as the Osborne Creek valley, were not deeply eroded and consequently "hang" on the deeply-scoured valleys.

Valley orientation also controlled the deposition of sediment during glacial advance and retreat. Thick wedges of glacial till were deposited on the lee (down-ice) side of hills and thin drift accumulated on the stoss (up-ice side) of uplands or hills. These features are "till shadow hills" (Coates 1981). Thus, even though the average till thickness in the region is 60 feet (18 m), south-facing slopes can contain six to ten times that thickness (Coates 1981).

The relationship between ice flow direction and topography determined the composition of the ice-contact deposits, especially of the glacial tills. Most of the material carried by the glacier was eroded from nearby sources. Usually, 90 percent of the material in a till sheet was carried only 10 miles or so. Some material travelled much longer distances, however, particularly in the north-south valleys (Coates 1981). Ice flowing out of the Adirondack Mountains carried sediment with a high percentage of metamorphic rock fragments. Ice crossing limestone terrane eroded calcareous sediments that were carried long distances along the valleys. Glacial deposits containing abundant metamorphic and carbonate rock fragments are called "bright drift" in the Binghamton area (Coates 1981). The WESTON Work Plan reported that bright drift underlies the floor of the Chenango River valley.

The ice in the uplands of the site area deposited clay or silt-rich sediment scraped from the surrounding shales. These sediments are the "drab drift" of southern New York State (Coates 1981). The WESTON Work Plan stated that thick, "drab" till probably underlies the northern wall of Osborne Creek.

The glacial margin became digitated as the ice thinned and retreated from the uplands. Glacial tongues or lobes projected several miles down-valley from the retreating ice sheet (Cadwell 1981). Proglacial lakes were trapped in valleys that dipped into the ice front. The WESTON Work Plan stated that a small, ice-marginal lake was probably confined in the Osborne Creek valley by the glacier in the Chenango Valley. Fine-grained, poorly washed sediment accumulated in these valleys. Meltwater drained freely from valleys that dipped away from the ice front. Well sorted, "clean" deposits of fluvial sand and gravel accumulated in these valleys.

Many smaller valleys are floored with till because they did not carry significant amounts of meltwater. Small lobes or ridges of till or sand and gravel in these smaller valleys mark recessional deposits that formed during hesitations in the retreat of the ice tongues. The WESTON Work Plan reported that the knob of sand and gravel at the mouth of Osborne Creek and the deposits underlying the irregular topography along the floor of the valley are recessional deposits.

Stratified deposits (bedded till or till with fine-grained proglacial land ice-marginal lake deposits) accumulated in low areas at angles to the ice front and in valleys that drained into the ice. The WESTON Work Plan reported that an ice-marginal lake probably occupied the Osborne Creek valley during glacial retreat and that colluvium probably overlies fine-grained lake deposits in the vicinity of the site. It was also stated that the lake deposits might interfinger with the kamic knob west of the site.

3.1.2.2 Regional Hydrology. Broome County is in the Glaciated Central Groundwater Region (Heath 1984). Groundwater in the site area is expected to be present in varying amounts in alluvial/colluvial, glacially derived overburden, and bedrock.

There are several potential aquifers in northeastern Broome County (Miller 1988). They include both large, outwash-filled valleys and small tributary valleys (MacNish and Randall 1982; Miller 1988). These aquifers are both unconfined and confined, and exhibit yields from 10 to over 100 gallons per minute (Miller 1988).

The Tri-Cities site is less than 1.3 miles (2 km) from the eastern edge of the Endicott-Johnson City Aquifer (Holecek 1982). The WESTON Work Plan reported that the aquifer may underlie the village of Port Crane. The nearest municipal water well field (River Road Water Association) is developed in the Endicott-Johnson City aquifer, approximately 2 miles (3.2 km) from the site (Holecek 1982). This well field is on the opposite side of the Chenango River from the confluence of Osborne Creek. It does not appear at this point, based on available information, that the municipal well field is impacted by the site. Depending on the results of the proposed RI activities, additional information regarding effects on regional hydrology may be developed. The Chenango Bridge umlaufberg lies between the Osborne Creek confluence and the western "arm" of the Endicott-Johnson city aquifer. The WESTON Work Plan reported that Osborne Creek is a "typical" small tributary valley in the Susquehanna-Chenango river system.

Alluvial/colluvial sediments are apron or fan-shaped surface deposits that occur at the base of slopes, or as ribbons along the floors of the stream valleys. They result from Holocene, recent, and present erosion, transport, and deposition of hilltop and hillside materials by surface waters and mass movements. The WESTON Work Plan reported that in glaciated areas, such as the region of the Tri-Cities Barrel site, the alluvial/colluvial materials can interfinger with and overlie glacially-derived outwash or kames. These permeable deposits can be recharged through the alluvial/colluvial deposits (Randall 1978). Up to 85 percent of the recharge to valley-train outwash aquifers can come from the adjacent uplands (Morrissey et al. 1987).

The "small tributary valleys" (i.e., Osborne Creek) have drainage areas of less than 30 square miles. They contain permeable material that is less than 10 feet thick, outcrops at the surface, and "pinches out" up-valley. The groundwater flows from the tributary mouths into or towards the main valleys (Holecek 1982).

The larger valley aquifers, which are over 40 feet thick (MacNish and Randall 1982; Holecek 1982), are comprised of glacial deposits, especially outwash and kames, that are the primary sources of groundwater in the region. Within the region, glacial outwash commonly yields large quantities of groundwater (MacNish and Randall 1982; Holecek 1982).

3.1.2.3 Site Hydrogeology. The site hydrogeology discussed in this section was developed by WESTON. The Tri-Cities Barrel site is on a till terrace that is probably mantled with a thin veneer of colluvium (Figure 3-4; Table 3-1). Silty clay till is exposed along road cuts and in a borrow pit to the south of Old Route 7. The terrace where the site is located is underlain by over 50 feet of the silty clay till. Silty sand was encountered in test boring CW-2B at the site at depths of 34 to 39 feet (Figure 3-5). The silty sand outcrops below an elevation of 970 feet above mean sea level, along the footslope of Osborne Creek's valley wall. The topography of the valley bottom below the 1,030-foot elevation is somewhat hummocky, suggesting that stagnant ice blocks lay in the Osborne Creek valley during the

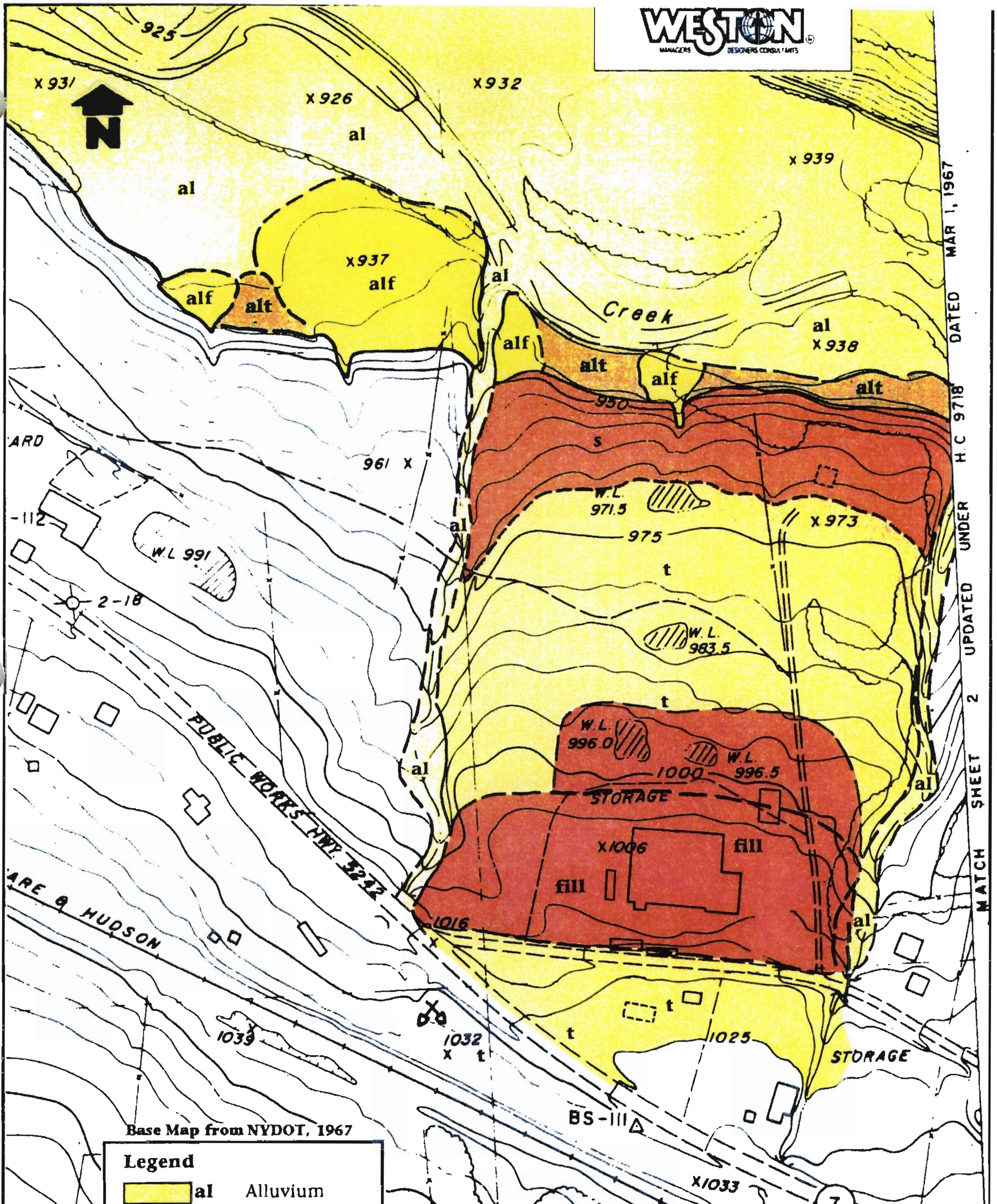


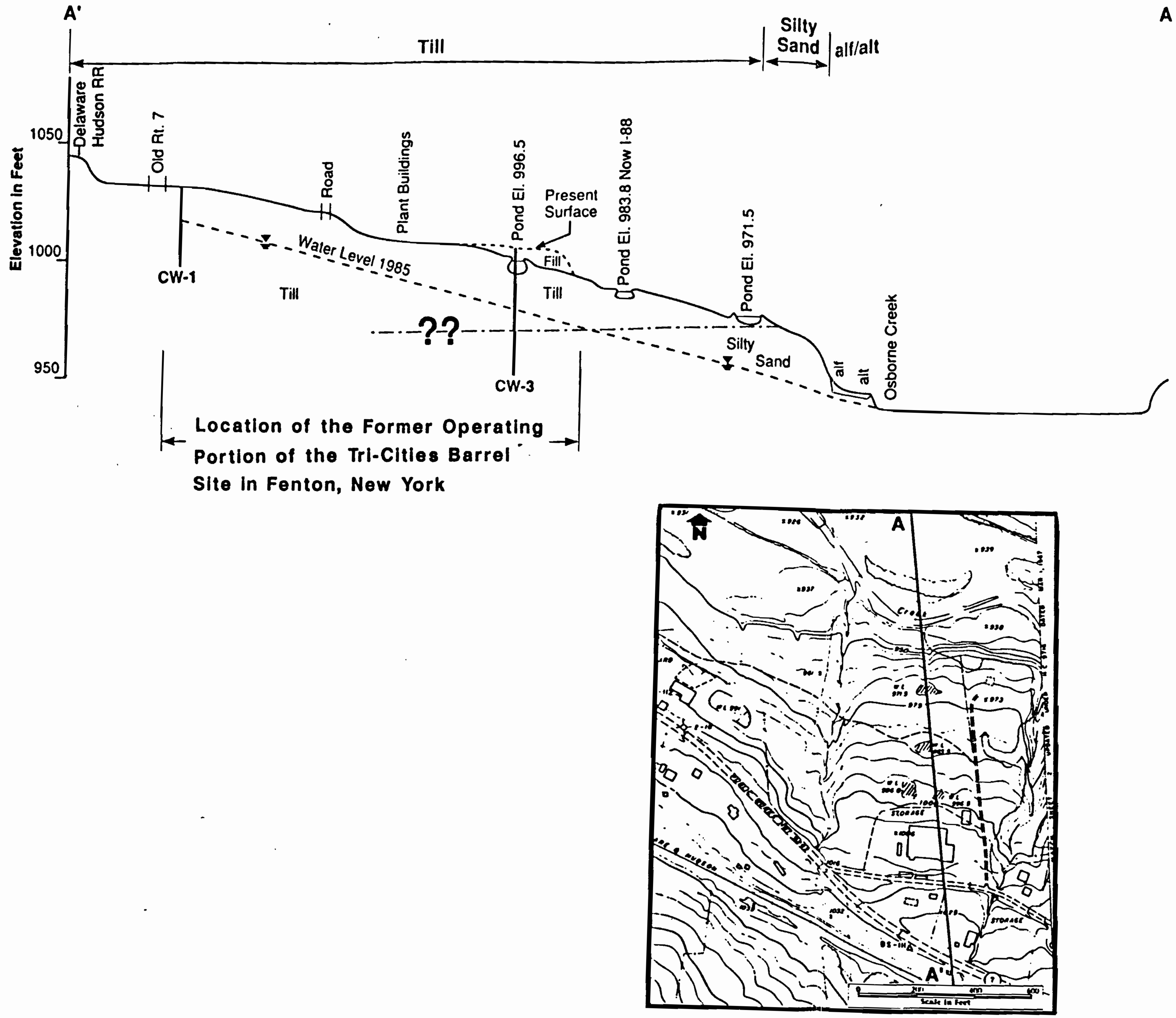
FIGURE 3-4
PRELIMINARY SITE SURFICIAL GEOLOGY
TRI CITIES BARREL

Table 3-1

Preliminary Site Surficial Geologic Map Units

Symbol	Unit	Description
al	alluvium	Modern floodplain deposits, well sorted, silt through cobbles, easily eroded, frequently flooded, high water table. Forms a "ribbon" along the stream channel.
alf	alluvial fan	Modern stream deposits, well sorted, silt through cobbles, subject to periodic flooding, has a high water table. Forms a lobate deposit where stream channel encounters a decrease in slope (usually along the footslopes of hills).
alt	stream terrace	Recent stream deposit, well sorted silt through cobbles, frequently flooded, high water table. Forms terraces along the modern streams. Probably includes colluvium.
t	till	Pleistocene till, poorly sorted, medium to stiff silty clay with little to some sand and gravel, trace cobbles, poorly bedded. Deposited at the margin of the glacier. Probably mantled by colluvium.
s	silty sand	Pleistocene proximal glacial lake deposit, poorly sorted, fine sand with little to some silt and gravel, poorly bedded. Deposited close to the edge of the glacier in an ice-marginal lake.

Source: Based on Muller and Cadwell, 1986; Giddings and others, 1971; topographic map interpretation; Phase II test borings onsite; and field reconnaissance.



Legend

alf	Alluvial fan
alt	Stream terrace
--▼--	Water level
— — —	Possible contact

Vertical Exaggeration 4:1

Topographic Surface based on 1967 NYDOT Route 7 Map

Geologic Information Based on Preliminary Site Surficial Geology Map and Soil Boring Information.

Water Level Information from Phase II Report, Engineering Science, 1986.

FIGURE 3-5
PRELIMINARY SITE
GEOLOGIC CROSS SECTION

deposition of the glacial sediments. The ice blocks then melted away, leaving an irregular surface. The WESTON Work Plan reported that the hummocky topography and limited borehole data imply that any bedding in the till and silty sand will be discontinuous.

Osborne Creek has cut through over 50 feet of glacial deposits since the glacier retreated from the area (17,000 years ago according to Cadwell 1981). The stream's base level is controlled by the Chenango River. Osborne Creek is probably depositing an alluvial fan at the river. The creek has deposited alluvium along its floodplain. A thin sheet of colluvium has been deposited across the top of the glacial deposits during post-glacial time.

Groundwater conditions in the overburden materials in the areas of the active facility are currently monitored by three wells (CW-1, CW-2B, and CW-3), installed during the ES/D&M Phase II investigation. Boring logs give little insight into whether the various lithologic units encountered are separate distinct water-bearing zones or a single saturated "aquiferous" unit. The ES/D&M investigation reports that individual lithologic units are probably discontinuous. Well construction details for downgradient wells CW-2B and CW-3 indicate that well screens were set at concordant elevations (top of well screen elevation 961.8 feet) into a moist to wet, silty gravelly sand (SM) and a moist, silty sandy gravel (GM), respectively. Both wells are approximately 49 feet in depth with the lower 10 feet screened. Overlying lithologies vary from silty clays to silty sands. Water levels in CW-2B and CW-3 were recorded in October 1985 to be at 26 and 28 feet below ground surface (bgs) with elevations of 974.7 and 972.2 ft MSL, respectively.

Upgradient well CW-1, located to the south of the facility and south of Old Route 7, is apparently finished at 34 feet bgs with the lower 10 feet screened as was the case with CW-2B and CW-3. The top of the screen elevation is approximately 24 feet below the ground surface feet while the water level

(October 1985) is 14 feet bgs (elevation 1,010 feet). The well is set into a highly fractured dark grey shale and overlain by moist sandy, gravelly silt.

The WESTON Work Plan reported that assuming the overburden behaves as a single hydrostratigraphic unit, groundwater flow, based on water levels in the three onsite wells, is to the north-northwest at a gradient of 352 feet per mile. ES/D&M Phase II slug test results indicate that the permeability of the water-bearing materials screened in CW-1, CW-2B, and CW-3 is 8.93×10^{-3}, 1.79×10^{-2}, and 1.89×10^{-3} cm/sec, respectively. The WESTON Work Plan reported that groundwater flow rates, assuming an effective porosity (n_e) of 0.2, are 1.8 to 16.9 feet per day.

A single bedrock well, reportedly 120 feet deep and located in the main facility, was sampled during the 1985 ES/D&M Phase II investigation. Despite the fact that construction details and a water level are not reported, the ES/D&M investigation (1986, page IV-4) concludes that groundwater in the bedrock is interconnected with groundwater in the overburden based on regional trends. WESTON concurred with this conclusion in its Work Plan and stated that "Coupled" systems such as that proposed at this site are common in this area. Figure 3-5 shows the result of extrapolating the water surface and uniform slope between CW-1 and CW-3 to Osborne Creek.

3.1.2.4 Previous Geophysical Investigation. An extensive geophysical survey was conducted at the Tri-Cities Barrel facility as part of the Phase II investigation conducted by ES/D&M in 1985. The purpose of this investigation was to evaluate the continuity of subsurface conditions, identify contaminant plumes, and locate any buried drums present at the site. The geophysical investigation at the site included electrical resistivity and magnetometer surveys.

The electrical resistivity survey was performed at select locations around the site perimeter and within the site boundary to confirm the continuity of site geologic units, locate major discontinuities, and, if possible, to map a potential contaminant plume. A Bison 235OB Earth Resistivity Meter was used to conduct vertical soundings and horizontal electrical profiles. Initial soundings that were conducted to a depth of 100 feet indicated that the top of weathered or fractured bedrock ranges from 48 to 52 feet below ground surface. The anticipated top of competent rock is between 66 and 88 feet below ground surface. Based on the subsurface investigation and geophysical investigation, the bedrock is believed to be overlain by a thick till unit consisting of interbedded silts, gravels, sands, and glaciaolacustrine clays.

Electrical resistivity profiles were conducted using electrode spacings of 10, 25, 50, and 100 feet to evaluate subsurface conditions at various depths. Information gathered during earlier stages of the project (Phase I) formed the basis for electrical resistivity profile locations. These locations were chosen to best represent upgradient (background) apparent resistivity values and downgradient locations where offsite contaminant migration might exist.

A number of anomalous areas were identified during the electrical resistivity survey at the site. The anomalous areas identified are believed to be the abandoned lagoons, roadway reinforcement material, and a roadway drainage ditch.

The direction of groundwater flow was also inferred from the results of the electrical resistivity survey and was believed to be to the north towards Osborne Creek within the site. It was noted that the flow direction may change slightly at shallow depths due to site disturbances associated with the operation of the previously existing waste lagoons and backfill material.

A conclusion of the geophysical report was that a hydrogeologic feature that may exist onsite is a relatively impermeable fragipan layer associated with Volusia soils in this area. According to geophysical sounding and Soil Conservation Service (SCS) data, the Tri-Cities Barrel site may have a fragipan layer present between 5 and 12 feet below the ground surface.

The magnetometer survey was performed on a tightly spaced grid pattern in the vicinity of the three abandoned lagoons to delineate lagoon boundaries and locate any buried ferromagnetic objects that may have been deposited in the lagoons as they were closed. A Geometrics Model G816/826A magnetometer was used to conduct the initial survey using a 10- by 10-foot grid as station locations.

There were four areas of ferromagnetic highs found within the survey grid. Three of the areas were associated with drum piles located on the site. The fourth area represented a truck trailer parked on the site. Three distinct anomaly patterns believed to be the locations of the closed lagoons were also identified to the north of the Tri-Cities Barrel building. A 1973 aerial photograph (Broome County) was used to confirm the locations of these lagoons in the area where the anomalies were identified. In addition, a pre-existing road seen on the aerial photograph coincides with a north-south linear feature identified on the western edge of the survey grid.

The magnetic survey did not detect any ferromagnetic material buried in the survey area.

3.1.3 Climate

The Tri-Cities Barrel site is located in Broome County and is part of the Eastern Plateau Climatic Division of New York State (National Oceanic and Atmospheric Administration (NOAA) 1988a). Global atmospheric circulation brings a great variety of air masses to the area. Masses of cold, dry air come from the northern interior of the continent. Warm, humid air originating at the Gulf of Mexico and adjacent tropical waters flows from the south. These two air masses provide the dominant characteristics of the local climate. The climate is thus classified as "humid continental" by the modified Koppen classification system (NOAA 1974). This climate is categorized by severe winters, moist seasons with precipitation evenly distributed throughout the year, and short, warm summers.

During most of the year, high and low-pressure systems move generally west to east through the area. During the winter months, high pressure tends to move northwest to southeast, and low pressure often moves from southwest to northeast. During the summer months, a high-pressure system called the Bermuda High may extend over the area for several days at a time with little significant movement. During the late summer, cold fronts (known as "back door" cold fronts) may move from the northeast through the area, although most cold fronts move from the northwest. Warm fronts tend to originate from the south.

The Tri-Cities Barrel site itself has no historical meteorological data representation. The nearest National Weather Service station is at Binghamton, 5 miles to the southwest. Table 3-2 displays average and extreme data for Binghamton through 1988. The source of numeric data for climatological parameters discussed in the following subsections is the National Climatic Data Center (NCDC), a branch of NOAA.

The NCDC annual average temperature (1951 to 1980) for Binghamton, New York is 45.7°F (7.6°C), with July being the warmest month (with an average temperature of 68.9°F or 20.5°C) and January being the coldest (averaging 21.2°F or -6°C). The record extreme temperatures at Binghamton are -20°F and 98°F during a 67-year period ending in 1988.

Precipitation is uniform throughout the year with moisture generally transmitted from the Gulf of Mexico and Atlantic Ocean through atmospheric circulation patterns and storm systems. Through 1988, Binghamton averaged 36.78 inches of precipitation throughout the year, with June experiencing the highest monthly average of 3.60 inches and February the lowest monthly average of 2.33 inches. Figure 3-6 depicts mean annual precipitation in Binghamton and surrounding counties during the period 1931 to 1988. It should be noted that the mean annual precipitation has gradually increased throughout the entire Eastern

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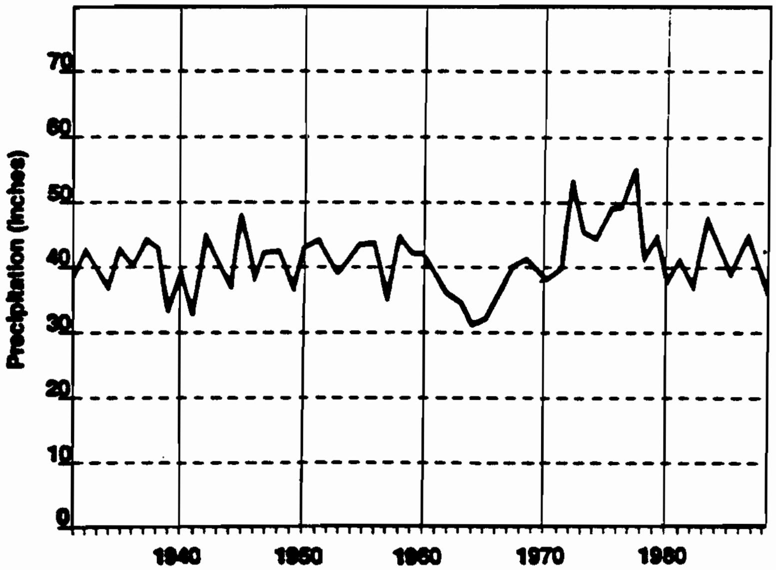
Table 3-2
Normals, Means, and Extremes
For Binghamton, New York

LATITUDE: 42 13'N LONGITUDE: 75 59'W ELEVATION: FT. GRND 1590 BARO 1618 TIME ZONE: EASTERN WBAN: 04725

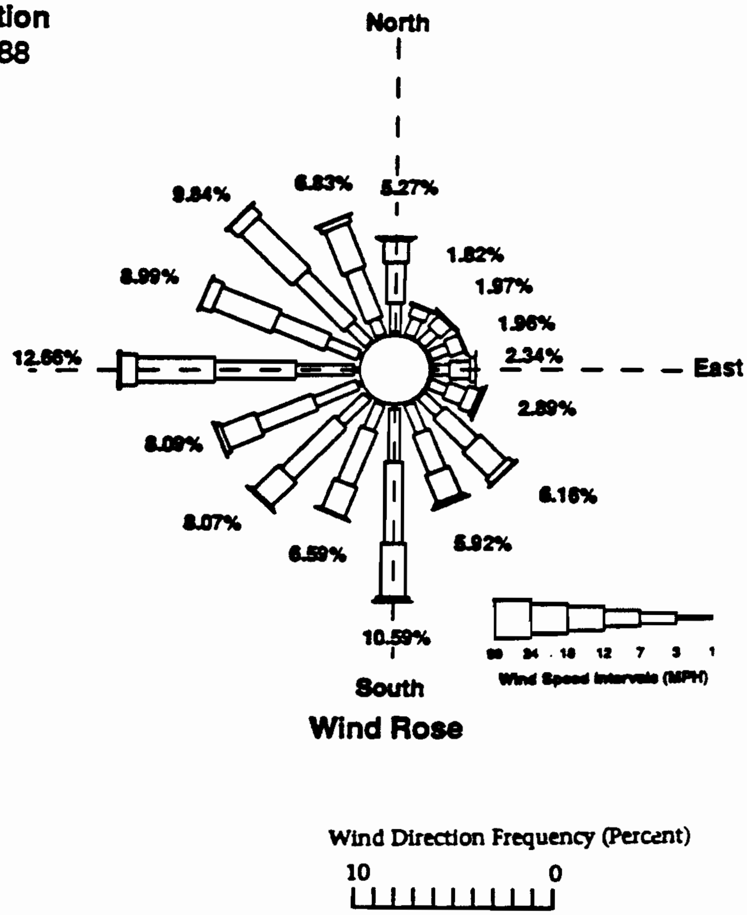
	(b)	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC	YEAR
TEMPERATURE F:														
Normals														
-Daily Maximum		28.0	29.6	38.7	53.5	64.9	73.9	78.4	76.4	68.9	57.6	44.4	32.4	53.9
-Daily Minimum		14.3	15.1	24.0	35.1	45.5	54.6	59.4	57.9	50.6	40.5	31.3	19.9	37.4
-Monthly		21.2	22.4	31.4	44.3	55.2	64.3	68.9	67.2	59.8	49.1	37.9	26.2	45.7
Extremes														
-Record Highest	37	63	66	82	85	89	94	98	94	96	82	77	65	98
-Year		1967	1954	1977	1985	1982	1952	1988	1985	1953	1963	1982	1984	JUL 1988
-Record Lowest	37	-20	-15	-6	9	25	33	39	37	25	17	3	-18	-20
-Year		1957	1979	1980	1982	1978	1980	1963	1965	1974	1976	1976	1980	JAN 1957
NORMAL DEGREE DAYS:														
Heating (base 65 F)		1358	1193	1042	621	313	79	16	35	178	493	813	1203	7344
Cooling (base 65 F)		0	0	0	0	9	58	137	104	22	0	0	0	330
% OF POSSIBLE SUNSHINE	37	37	42	45	50	56	61	65	61	55	48	31	28	48
MEAN SKY COVER (tenths)														
Sunrise - Sunset	37	8.0	7.9	7.6	7.2	7.1	6.6	6.4	6.5	6.6	6.9	8.1	8.4	7.3
MEAN NUMBER OF DAYS:														
Sunrise to Sunset														
-Clear	37	2.5	2.7	4.0	5.1	4.8	5.0	5.5	5.1	5.6	5.9	2.6	2.0	50.7
-Partly Cloudy	37	7.1	6.4	7.2	6.9	9.1	11.2	13.0	11.6	10.1	8.3	5.8	6.0	102.7
-Cloudy	37	21.5	19.2	19.8	18.0	17.2	13.8	12.5	14.2	14.3	16.8	21.6	23.0	211.8
Precipitation														
.01 inches or more	37	16.6	14.6	15.6	13.6	13.1	12.2	10.6	10.7	10.1	11.8	14.9	17.5	161.3
Snow, Ice pellets														
1.0 inches or more	37	6.0	4.9	3.5	1.1	0.1	0.0	0.0	0.0	0.0	0.1	2.3	5.6	23.7
Thunderstorms	37	0.1	0.1	1.1	2.1	3.6	6.5	6.6	5.3	2.8	1.1	0.3	0.2	29.7
Heavy Fog Visibility														
1/4 mile or less	37	3.3	3.2	4.8	3.9	4.1	4.4	4.7	5.2	5.7	4.4	4.5	4.5	52.5
Temperature F														
-Maximum														
90 and above	37	0.0	0.0	0.0	0.0	0.0	0.3	1.2	0.6	0.2	0.0	0.0	0.0	2.4
32 and above	37	20.7	16.2	8.5	0.8	0.0	0.0	0.0	0.0	0.0	0.1	3.4	15.6	65.3
-Minimum														
32 and below	37	29.8	26.5	25.2	11.9	1.4	0.0	0.0	0.0	0.2	6.0	17.3	27.4	145.8
0 and below	37	3.8	2.5	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.3	7.9
AVG. STATION PRESS (mb)	16	955.5	956.4	955.8	955.2	956.7	957.4	958.6	960.0	960.2	960.0	958.2	957.1	957.6
RELATIVE HUMIDITY (%)														
Hour 01	37	78	77	75	72	74	80	81	83	86	80	80	81	79
Hour 07	37	80	79	79	76	78	82	84	88	90	85	82	82	82
Hour 13 (Local Time)	37	71	67	63	56	56	58	57	60	63	62	69	73	63
Hour 19	37	74	71	67	61	61	65	65	69	73	69	74	77	69
PRECIPITATION (inches):														
Water Equivalent														
-Normal		2.54	2.33	2.94	3.07	3.19	3.60	3.48	3.35	3.32	3.00	3.04	2.92	36.78
-Maximum Monthly	37	6.39	4.36	6.00	8.57	6.46	9.46	7.40	7.48	9.66	9.43	7.52	6.11	9.66
-Year		1979	1971	1980	1983	1968	1960	1956	1959	1977	1955	1972	1983	SEP 1977
-Minimum Monthly	37	0.76	0.51	0.69	0.98	0.78	0.98	0.83	0.61	0.61	0.26	1.01	0.94	0.26
-Year		1970	1968	1981	1985	1962	1979	1955	1953	1961	1963	1960	1960	OCT 1963
-Maximum in 24 hrs	37	1.80	2.16	1.95	2.86	2.29	3.19	3.24	3.29	3.57	3.88	2.66	2.81	3.88
-Year		1958	1966	1964	1980	1988	1972	1976	1988	1985	1955	1972	1983	OCT 1955
Snow, Ice pellets														
-Maximum Monthly	37	43.6	44.3	33.5	22.9	3.4	0.0	0.0	0.0	T	4.9	24.4	59.6	59.6
-Year		1987	1972	1971	1983	1966				1970	1988	1954	1969	DEC 1969
-Maximum in 24 hrs	37	18.4	23.0	15.8	11.5	3.4	0.0	0.0	0.0	T	4.8	10.1	15.6	23.0
-Year		1964	1961	1971	1960	1966				1970	1988	1953	1969	FEB 1961
WIND:														
Mean Speed (mph)	37	11.6	11.7	11.8	11.5	10.1	9.3	8.4	8.3	8.8	9.8	10.9	11.3	10.3
Pevailing Direction through 1963		WSW	SSE	NW	WNW	NNW	NNW	WSW	SSW	SSW	WSW	NNW	WSW	WSW
Fastest Mile														
-Direction(!!)	34	NW	NW	NW	W	W	NW	NW	N	NW	S	SE	NW	S
-Speed (MPH)	34	59	66	61	52	54	60	60	58	42	72	57	59	72
-Year		1959	1956	1955	1956	1954	1957	1983	1958	1960	1954	1951	1956	OCT 1954
Peak Gust														
-Direction (!!)	5	W	E	W	W	NW	NW	NW	W	SW	NW	W	SW	NW
-Speed (MPH)	5	43	52	46	52	54	59	47	49	41	39	44	48	59
-Date		1987	1985	1986	1985	1988	1988	1988	1987	1986	1987	1988	1985	JUN 1988

[a] Source: Local Climatological Data, Annual Summary with Comparative Data, 1988; compiled from records on file at the NCDC, Asheville NC, 28801.

[b] Length of record in years, although individual months may be missing.



Precipitation
1931-1988



Wind Rose

The wind rose figure represents data from Binghamton, New York, 1981 through 1985 calms excluded.
Source: NCDC, 1989.
Mean annual precipitation for eastern plateau from region for the period of: 1931-1988.
Source: NOAA, 1988b.

ESC
ENVIRONMENTAL STRATEGIES CORPORATION
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Figure 3-6
Wind and Precipitation
Tri-Cities Barrel Site
Fenton, New York

Plateau region. The figure shows that, since a drought period from 1962 to 1967, annual average precipitation through 1988 has been nearly 45 inches per year.

Binghamton averages approximately 161 days per year with at least 0.01 inch of precipitation. Thunderstorms occur on approximately 30 days per year on the average.

Figure 3-6 also depicts an average wind rose for Binghamton from 1981 to 1985. The length of the bars indicate the frequency wind blows from a given direction, while the width of each bar segment indicates the wind speed. Prevailing winds in the Binghamton area are generally from the west, with a southwesterly component during the warmer months and a northwesterly component prevailing in the colder months. Average wind speed is 10.3 mph (4.6 m/sec). Refer to Table 3-2 for further details of wind data from Binghamton.

3.1.4 Population and Environmental Resources

Total population within a 3-mile radius of the site has been estimated to be 6,620 people (including Chenango Forks, Port Crane, and Binghamton East). Of these, 3,550 are estimated to use groundwater as a residential water source. Surface water is used for irrigation at two berry farms located approximately 1 mile north of the intersection of Rt. 88 and Rt. 369.

Environmental resources include groundwater, surface water, woods, and gravel pits. No wetlands are reported to exist within 1 mile of the site.

3.1.5 Characteristics of Chemical Contamination

3.1.5.1 Sources. The potential sources of contamination which will be considered during this investigation may include:

- Spillage from drum handling activities throughout the site. (Note: These activities may also be regulated by RCRA)

- The drums which are reported to be buried at the site
- The unlined lagoons, which have since been excavated or backfilled
- The incinerator-related spillage during drum handling, ash generation and handling, and air emissions
- The paint spray booth located inside the process buildings (air emissions)
- The sump located inside the operations building
- The septic tank located southwest of the operations building
- Blaster dust generation, collection, and handling

It is recognized that the two aboveground oil storage tanks and the underground storage tank(s) located near the gas pumps and an oil spill that occurred at the facility are also potential sources of contamination. However, these sources are considered to be the owner's responsibility pursuant to Section 101(14) of CERCLA which states "The term "hazardous substance" ... does not include petroleum, including crude oil or any fraction thereof which is not otherwise specifically listed or designated as a hazardous substance..." Therefore, potential releases from petroleum tanks should not be part of this CERCLA investigation. The former wastewater transfer area is most appropriately regulated under RCRA and is not considered a CERCLA source area. Therefore, this Work Plan does not include investigation of these tanks or the transfer area which should be conducted as a separate effort by the owner with results made available such that they can be used in the overall interpretation of the site conditions.

The Tri-Cities Barrel facility was used for the reclamation of used barrels from 1955 to 1992. The barrels were cleaned using a combination of physical/chemical/mechanical means including incineration, particle blasting, and scraping and were then rinsed with a sodium hydroxide solution during the cleaning process (Branagh 1979). From 1955 to the early 1960s, wastewater was discharged to the ground and allowed to infiltrate and runoff. It is possible that this runoff may have reached Osborne Creek. From the early 1960s to 1980, the rinse solution was disposed of in unlined lagoons and allowed to evaporate (infiltration is also possible; G. Warner 1985).

A sample of the rinse tank wastewater and a sample of the lagoon water were sent to O'Brien & Gere for analysis in 1979. These samples were analyzed for chlorides, cyanides, PCBs, and pH (Hill 1979). A sample of the caustic rinse-water collected by the NYSDEC was analyzed for organic constituents (GC/MS) by RECRA Research in 1982. This analysis showed the rinse water to contain several organic compounds that are classified as hazardous wastes due to their toxicity or ignitability (Table 3-3; Baker 1982). An analysis of the caustic waste water sampled by the USEPA in 1983 showed that the rinse water contained several trace metals (Table 3-3) and had a pH of 13. Based on this corrosivity determination, the rinsewater was designated as a hazardous waste (Cosentino 1984).

Caustic rinsewater was stored in drums and storage tanks and shipped to CECOS International for a period of time (G. Warner 1983). During two separate site inspections made in 1983, it was noted that barrels containing this wastewater were leaking onto the ground (Lepak NYSDEC communication 1983).

Another byproduct of the barrel reclamation process is blaster dust resulting from particle blasting the interior of drums for reprocessing, which is collected in a baghouse onsite. EP toxicity analysis of this dust (Table 3-3) by the USEPA in 1983 indicated that the blaster dust exceeded the maximum allowable lead concentration (NYSDEC 1984). The dust was classified as a hazardous waste because of toxic characteristics (Cosentino 1984). According to the WESTON Work Plan, the blaster dust was normally collected and stored in 55-gallon drums (Cosentino 1984), although in July 1983, Mr. Warner reported that he had a backlog of blaster dust, and that he would like to dispose the dust at the North

Table 3-3
Analysis Of Waste Materials[a]

Constituent[b]	Lagoon[d,f] (ug/L)	Rinse Water Tank (ug/L)	Discharge[c] from Skimmer (ug/L)	Blaster Dust (ug/L)	Conc.in[e] Hazardous Waste (ug/L)
pH	10.5	13.0[d]	13	NA	2<x<12.5
Chloride	50,000	800,000[d]	NA	NA	NM
Cyanide	720	1,100[d] 4,200[f]	NA	NA	NM
PCB	< 1.0	< 1,600[d]	NA	NA	50,000[h]
Arsenic	NA	NA	20J	<8	5,000[g]
Barium	NA	NA	60	3,500	100,000[g]
Cadmium	NA	NA	40	90	1,000[g]
Chromium	NA	NA	280	130	5,000[g]
Lead	NA	NA	290	6,500	5,000[g]
Mercury	NA	NA	0.5J	<0.2	200[g]
Selenium	NA	NA	<7	7	1,000[g]
Silver	NA	NA	20	8J	5,000[g]
Benzene	NA	44[f]	NA	NA	h,i
1,1-Dichlorethane	NA	11[f]	NA	NA	NM
1,1-Dichloroethylene	NA	18[f]	NA	NA	h
Ethylbenzene	NA	2,600[f]	NA	NA	NM
Tetrachloroethylene	NA	4,500[f]	NA	NA	h
Toluene	NA	5,600[f]	NA	NA	h
1,1,1-Trichloroethane	NA	200[f]	NA	NA	h
Trichloroethylene	NA	27,000[f]	NA	NA	h
Total Recoverable Phenolics	NA	1,300,000[f]	NA	NA	h

a = Source: Engineering Science, 1986.
b = All constituents analyzed in the two studies are listed.
c = Samples analyzed by USEPA, 17 November 1983 (Cosentino, 1984).
d = Samples analyzed by O'Brien & Gere Engineers, 15 October 1979 (Hill, 1979).
e = NYSDEC (1984), "Regulations Relating to the Identification and Listing of Hazardous Wastes".
f = Samples collected by NYSDEC in May 1982, analyzed by RECRA Research (Baker, 1982).
g = Maximum allowable concentration (ug/L) for the EP Toxicity test.
h = Compound listed as a hazardous waste due to toxicity.
i = Compound identified as a hazardous waste due to ignitability.

Notes: NA = Not analyzed.
J = Concentration is less than instrument detection limit, value listed is estimated.
< = Actual value known to be less than given value.
NM = No maximum concentration - not listed as a hazardous or toxic compound.

Fenton landfill facility (G. Warner 1983). The ultimate disposal of the blaster dust is unknown according to the WESTON Work Plan.

Based on available information, the drums reconditioned at Tri-Cities Barrel were typically used to store methylene chloride, Freon, dichloroethene, toluene, xylene, styrene, methyl ether, phenol, various oils and industrial chemicals (F. Warner, 1979). The residual quantity of these chemicals that arrived at the site in the drums is unknown. The drums are reported to have been empty when they arrived at Tri-Cities Barrel (G. Warner 1985). (According to RCRA, a 55-gallon drum is considered an "empty container" if it contains less than 1 inch of material).

3.1.5.2 Soils. Three soil samples were collected in November 1985 (Figure 3-7). The soil sample designated SS-1 was a "background" surface soil sample taken near old Route 7. SS-1, however, may have been collected from an area that was used to store drums and as a result, may not be representative of background conditions at the site. The other two samples (SS-2 and SS-3) were collected from fill material over the former lagoon area. SS-2 was a surface soil sample and SS-3 was collected from a depth of 4 feet below ground surface in an auger hole. These samples were analyzed for metals (ICPES) and organic constituents (GC/MS; Table 3-4).

Based on these results, it was concluded that these three soil samples do not appear to indicate a metals contamination at the site although beryllium slightly exceeded typical values found in soils at SS-2, and was found at a higher level than the single "background" sample. Barium and manganese were found in SS-3 at higher levels than in the "background" sample, but only manganese exceeded the typical values in soil samples as described in the NYSDEC Phase II Engineering Investigations Report. Cobalt was higher than "background" in both SS-2 and SS-3, and the levels in all three samples exceeded

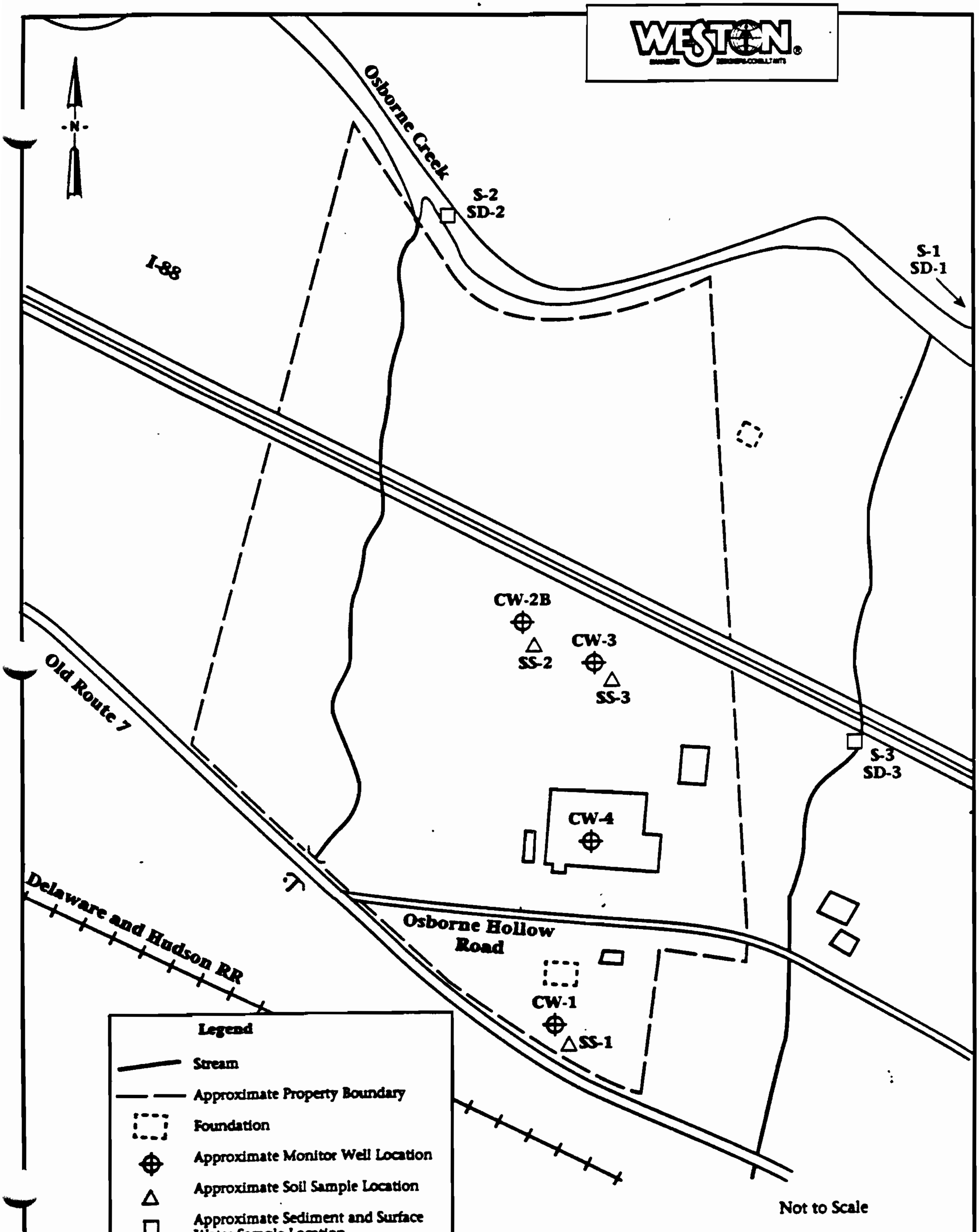

FIGURE 3-7
PHASE II SAMPLE LOCATIONS
TRI-CITIES BARREL

Table 3-4
Analytical Results of Soil Samples[a]

Contaminant[b]	SS-1 Surface (mg/kg)	SS-2 Surface (mg/kg)	SS-3 Surface (mg/kg)	Typical Background Values[c,d] in Soil Samples (mg/kg)
	Soil Sample Identification			
Aluminum	16,100	12,200	12,400	150,000-600,000
Arsenic	14	10	8.9	<40
Barium	79	74.3	95.1	1-1,000
Beryllium	0.65	1.1	0.65	<1
Calcium	2,150	1,220	1110	NA
Chromium	18.3	17.6	17.3	<250
Cobalt	15.6	22.9	19.4	0.1-13
Copper	18.4	24.9	21.0	10-80
Iron	36,000	36,500	33,900	10,000-100,000
Magnesium	3,050	3,890	3,700	NA
Manganese	798	756	1,230	600-900
Nickel	27.2	36.6	30.2	3-1,000
Potassium	732	760	704	NA
Tin	6.0	6.0	[3.5]	2-300
Vanadium	25.8	17.0	16.2	5-140
Zinc	127	97.2	109	10-300
Lead	45.5	27.6	12.3	2-200
Tetrachloroethene	0.006u	0.020	0.076	NA
1,1-Dichloroethane	0.006u	0.005u	0.0063	NA
Trans-1,2-Dichloroethene	0.006u	0.0042J	0.020	NA
1,1,1-Trichloroethane	0.006u	0.005J	0.017	NA
Trichloroethene	0.006u	0.005u	0.014	NA
Fluoranthene	1.30	22u	22u	NA
Pyrene	1.30	22u	22u	NA
Chrysene	0.89	22u	22u	NA
Total PAHs	3.49			

[a]Source - ES/D&M, 1986.
[b]Only those contaminants that were detected in one or more samples are listed. A full listing of testing parameters is shown in Appendix D of the ES/D&M Report dated June 1986.
[c]Fribert, et al., (1979) Handbook of Toxicology of Metals.
[d]Davies (1980), Applied Soil Trace Elements.
Notes: NA = Not Available.
J = Concentration is less than instrument quantification limit, estimate.
u = Concentration is less than listed detection limit.
[ ] = Concentration is less than contract required detection limit.
SS = Soil Samples.

the typical values found in soils. Magnesium and nickel, while within the range of values typically found in soils, exceeded "background" levels in both SS-2 and SS-3.

A comparison of the "background" inorganic concentrations to the other two soil samples collected show that the "background" concentrations were either greater than or equal to at least one of the other onsite samples for the following analytes: aluminum, arsenic, barium, beryllium, calcium, chromium, iron, manganese, potassium, tin, vanadium, zinc, and lead.

Low levels of volatile organics were found in soil samples SS-2 and SS-3. The results for sample SS-3 indicate the presence of tetrachloroethene (76 ug/kg), 1,1-dichloroethane (6.3 ug/kg), trans-1,2-dichloroethene (20 ug/kg), 1,1,1-trichloroethane (17 ug/kg), and trichloroethene (14 ug/kg). Tetrachloroethene (20 ug/kg) was also found in SS-2. These values suggest that plant operations may have contaminated the fill material taken from a reportedly "clean" quarry immediately south of old Route 7. Soils from below the lagoons were not sampled. Polycyclic aromatic hydrocarbons (PAHs) (fluoranthene, pyrene, and chrysene) were found in the background sample SS-1 (total PAHs = 3.49 mg/kg). These compounds are common constituents of creosote, coal tar, asphalt, and automobile and truck emissions.

3.1.5.3 <u>Groundwater</u>. Three monitoring wells were installed onsite by ES/D&M (Figure 3-7). Well CW-1 was placed upslope/upgradient, south of the TCB building. Wells CW-2B and CW-3 were installed in the area of the former lagoons. Groundwater samples were collected from the three monitoring wells and the plant production well (CW-4), and were analyzed for organic constituents (GC/MS). The results are reported in Table 3-5 and well locations are shown in Figure 3-7.

Organic compounds were detected in CW-3 above background levels. Trichloroethene (TCE), detected at 10 ug/l, vinyl chloride, estimated at 6.5 ug/l, and benzo(a)pyrene, estimated at 1.9 ug/l, were

Table 3-5
Analytical Results for Groundwater Samples[a]

Contaminant[b]	CW-1 (ug/L)	CW-2B (ug/L)	CW-3 (ug/L)	CW-4 (ug/L)	New York[c] Water Quality Standards (ug/L)	MCL[d,e,f] (ug/L)
	Sampling Location					
Di-n-butylphthalate	1.7J	10u	10u	3.0J	770	NS
Vinyl Chloride	10u	6.5J	6.5J	10u	5.0	2.0
Trans-1,2-dichloroethene	5u	2.2J	17	5u	50	100
Trichloroethene	5u	5.5	10	5u	10.0	5.0
Bis(2-ethylhexyl)phthalate	10u	7.6	24	2.6J	4,200	4.0(T)
Acetone	10u,B	10u,B	20B	10u,B	NS	NS
1,1-Dichloroethene	5u	5u	1.7J	5u	NS	7.0
1,1-Dichloroethane	5u	5u	9.2	5u	NS	NS
1,1,1-Trichloroethane	5u	5u	12	5u	NS	200
Tetrachloroethene	5u	5u	3.4J	5u	NS	5
Toluene	5u	5u	6.8	5u	5.0	1,000
Phenol	10u	10u	5.3	10u	1.0	NS
Butylbenzylphthalate	10u	10u	4.6	10u	NS	NS
Benzo(a)pyrene	10u	10u	1.9J	10u	ND	0.2
Chlordane	0.5u	0.5u	3.8	0.5u	0.1	2.0
Aroclor 1242	0.5u	0.5u	2.9	0.5u	0.1	0.5

[a]Source - ES/D&M, 1986.
[b]Only those contaminants that were detected in one or more samples are listed. A full listing of testing parameters is presented in Appendix D of the ESI/D&M Report dated June 1986.
[c]"Groundwater Quality Standards and Effluent Standards and/or Limitations", 6 NYCRR Part 703
[d]Maximum contaminant levels.
[e] Drinking Water Regulations and Health Advisories, Office of Drinking Water, Washington, DC, April 1990.
[f]56FR3526 National Primary Drinking Water Regulations; Synthetic Organic Chemicals and Inorganic Chemicals; Monitoring for Unregulated Contaminants; National Primary Drinking Water Regulations.

Notes:
u = Concentration in sample is less than listed instrument detection limit.
J = Concentration is less than instrument quantification limit, estimate.
B = Constituent also found in method blank and wash blank, concentrations listed are corrected for contamination level in the method blank. Acetone - Method Blank (8.0 ug/L), Wash Blank (350 ug/L).
NS = No standard.
ND = Not detectable.
T = Tentative.

found at levels above the MCL guidelines (Table 3-5). Trans-1,2-dichloroethene (17 ug/l), bis(2-ethylhexyl)phthalate (24 ug/l), 1,1-dichloroethane (9.2 ug/l), 1,1,1-trichloroethane (12 ug/l), and toluene (6.8 ug/l) and butyl benzylphthalate (4.6 ug/l) were detected at levels above background, but below the New York State drinking water quality standards and federal guidelines for groundwater and are therefore not of concern at these concentrations. Toluene (6.8 ug/l), phenol (5.3 ug/l), chlordane (3.8 ug/l), and Aroclor 1242 (a PCB, 2.9 ug/l), were detected at levels above the water quality standards. Vinyl chloride, tetrachloroethene, and benzo(a)pyrene were detected in the sample above water quality standards but below instrument quantification limits.

Well CW-2B had low levels of trans-1,2-dichloroethene and bis(2-ethylhexyl)phthalate. The estimated value for vinyl chloride, 6.5 ug/l, is above the water quality guidelines of 2 ug/l. Trichloroethene, found at 5.5 ug/l exceeds the MCL guidelines.

Seven residential wells on Osborne Hollow Road and old Route 7 near the Tri-Cities Barrel site were sampled on May 22, 1990, for halogenated organics and purgeable aromatics by the Broome County Health Department. The samples were analyzed by the New York State Department of Health, Wadsworth Center for Laboratories and Research. No contamination was detected in these upgradient and cross-gradient wells. No purging or sample collection techniques were included in the data package so the validity of this data cannot be evaluated.

Table 3-6 presents the properties of organic contaminants found in waste, groundwater, soil, and sediment samples that are relevant to assessing their migration potential and behavior at the site. As noted in Table 3-6, the solubility of organic contaminants previously detected at Tri-Cities Barrel varies from totally miscible compounds, such as phenol, to non-polar, halogenated compounds with extremely low solubilities, such as TCE. Organic compounds, depending on their solubility, density, and other physical

Table 3-6

Organic Contaminant Properties

Chemical Contaminant	Specific Gravity	Behavior in water*	Solubility
Vinyl Chloride	0.920	LNAPL	Insoluble
1,1 DCE	1.213	DNAPL	Slight
1,2 DCE	1.274	DNAPL	Slight
1,1,1 TCA	1.349	DNAPL	Slight
TCE	1.456	DNAPL	Slight
Benzene	0.879	LNAPL	Slight
PCE	1.631	DNAPL	Little
Toluene	0.866	LNAPL	Slight
Ethylbenzene	0.867	LNAPL	Slight
Phenol	1.072	Dissolves	Very Soluble
Fluoranthene	Varies	DNAPL	Insoluble
Pyrene	1.271	DNAPL	Insoluble
Benzo(a)pyrene	1.351	DNAPL	Insoluble
Chrysene	1.274	DNAPL	Insoluble
Aroclor 1242	1.381-1.392	DNAPL	Insoluble
Chlordane	1.59-1.63	DNAPL	Insoluble

*DNAPL= Dense nonaqueous phase liquid, tends to sink through water.
LNAPL= Light nonaqueous phase liquid, tends to float on water.

factors such as method of introduction, can be present in a number of different phases, which in turn can affect the migration behavior.

In the WESTON Work Plan, the following general discussion was presented to address certain chlorinated organic compounds.

> When introduced as free product in water, the majority of low-solubility compounds, such as TCE, remain as nonaqueous phase liquids (NAPLs), with a minor portion going into solution. The water soluble phase tends to migrate with groundwater flow. The rate of migration of the NAPL is governed by density, viscosity, and the presence of organic matter, which causes some compounds to sorb onto clays and other solid surfaces. Low density liquids like gasoline (LNAPLs) tend to float on the water table, spreading out in the downgradient direction. Denser, non-soluble compounds (DNAPLs) tend to sink through aquifers and migrate along surfaces with relatively low permeability and into fractures in accordance with gravity and subsurface topography. DNAPL migration tends to leave up to 5 percent of the free product behind, allowing dissolution over time (Mackay, 1985). A common complication associated with the interpretation of organic contamination is that organic compounds are rarely found at concentrations approaching their solubility limits in groundwater even when the NAPL phase is present. According to Mackay et al. (1985), observed concentrations are usually more than a factor of 10 lower than their solubility limit, implying that large volumes of groundwater can be contaminated by organic liquids like TCE over a great period of time.

In the WESTON Work Plan, it was stated that the persistence of contaminants at Tri-Cities Barrel over time may be attributed to one or more of the following:

- The presence and slow movement of dense, nonaqueous phase (free product) in enclaves (pockets) on the bedrock surface and in fractures
- The release of contaminants sorbed on soils

While the possible presence of DNAPLs is acknowledged, it should be noted that there is insufficient soil chemistry and geological data available at the site to conclude that DNAPLs have migrated to depth and may be present in "enclaves on the bedrock surface and in fractures." The site investigation proposed in this Work Plan is directed toward an evaluation of the probable source areas which includes an assessment of the presence of both LNAPLs and DNAPLs.

3.1.5.4 Surface Water and Sediments. Springs and seeps are locations where groundwater is discharged to the surface. Thus, contamination found in surface water samples collected from a spring or seep is usually representative of groundwater contamination at that location. Streams are formed from water discharged from springs and seeps and from runoff water. Concentrations detected in surface water and sediments are thus dependent on how contaminants are released into groundwater and diluted or washed away by water from upstream sources.

Three surface water samples were collected in November 1985 as part of the ES/D&M Phase II investigation (Figure 3-7). These samples were analyzed for metals (ICPES) and organics (GC/MS). Sodium was the only constituent found in the downgradient sample (S-2) at a concentration greater than the upgradient sample (S-1; Table 3-7). The analyses of surface water samples showed iron at concentrations less than the NYSDEC Class D surface water quality standards (NYSDEC 1991). No organic compounds were detected in any of the surface water samples.

Three sediment samples were collected in November 1985 as part of the ES/D&M Phase II investigation (Figure 3-7). These samples were analyzed for metals (ICPES) and organics (GC/MS). Several metals were found in the SD-3 downgradient sample at concentrations greater than the background (SD-1) concentration level (Table 3-8) including calcium (1,630 mg/kg), manganese (1,200 mg/kg), magnesium (3,820 mg/kg), iron (40,000 mg/kg), cobalt (20.1 mg/kg), chromium (16.1 mg/kg), beryllium (0.70 mg/kg), barium (74.3 mg/kg), tin (7.8 mg/kg), zinc (130 mg/kg), and lead (34.8 mg/kg). The statistical significance of these differences is unknown. The concentrations of aluminum (13,800 mg/kg),

Table 3-7

Analytical Results Of Surface Water Samples[a]

Metals[b]	Surface Water Sample Identification S-1 (ug/L)	S-2 (ug/L)	S-3 (ug/L)	NYSDEC[c] Water Quality Criteria (ug/L)
Calcium	13,600	13,300	10,200	NS
Iron	220	150	210	300
Lead	[4]	6	17	d
Manganese	132	118	23	NS
Sodium	8,000	13,000	9,000	NS
Zinc	20	20u	20u	d

[a]Source - ES/D&M, 1986.
[b]Only metals detected in one or more samples are listed. No organic contaminants were detected at levels above the detection limits. A full listing of testing parameters is shown in Appendix D of the ES/D&M Report dated June 1986.
[c]NYSDEC (1991). "Water Quality Regulations for Surface Waters and Groundwaters," GNYCRR Section 703.5, Water Class D, September 1, 1991.
[d]Standard depends on hardness of water.
Notes: [ ] = Concentration measured is less than contract-required detection limit.
NS = No standard.
u = Concentration is less than listed detection limit.

Table 3-8

Analytical Results for Sediment Samples[a]

Contaminant[b]	Sediment Sample Identification SD-1 (mg/kg)	SD-2 (mg/kg)	SD-3 (mg/kg)	Typical Values[c,d] in Soil Samples (mg/kg)
Aluminum	13000	13800	11700	150,000-600,000
Arsenic	10.7	9.5	8.2	< 40
Barium	62	57.9	74.3	1-1,000
Beryllium	0.58u	0.52u	0.70	< 1
Calcium	817	932	1630	NA
Chromium	15.7	15.7	16.1	< 250
Cobalt	19.9	19.6	20.1	0.1-13
Copper	23.4	21.8	21.8	10-80
Iron	39,600	36,800	40,000	10,000-100,000
Magnesium	3,690	3,910	3820	NA
Manganese	921	674	1200	600-900
Nickel	33.9	26.9	29.1	3-1,000
Potassium	[557]	650	547	NA
Tin	[3.3]	4.2	7.8	2-300
Vanadium	19.8	19.7	17.4	5-140
Zinc	92.5	95.2	130	10-300
Lead	8.5	16.1	34.8	2-200
Fluoranthene	0.924u	1.056u	0.350J	NA
Pyrene	0.924u	1.056u	0.2600J	NA
Chrysene	0.924u	1.056u	0.990J	NA
Total PAHs			1.60J	

[a]Source - ES/D&M, 1986.
[b]Only those constituents that were detected in one or more samples are listed. A full listing of testing parameters is shown in Appendix D of the ESI/D&M Report dated June 1986.
[c]Friberg, et al., (1979) Handbook of Toxicology of Metals.
[d]Davies (1980), Applied Soil Trace Elements.

Notes: NA = Not available.
J = Concentration is less than instrument quantification limit, estimate.
u = Concentration is less than listed detection limit.
[ ] = Concentration is less than contract required detection limit.
SD = Sediment samples.

calcium (932 mg/kg), magnesium (3,910 mg/kg), zinc (95.2 mg/kg), potassium (650 mg/kg), lead (16.1 mg/kg), and tin (4.2 mg/kg) in the SD-2 downgradient sample exceeded the concentration levels in the SD-1 upgradient sample. The statistical significance of these differences is unknown. Manganese and cobalt were the only metals that exceeded the typical range of metallic elements in surface soils (Friberg 1979). However, the concentrations of manganese and cobalt were less than the upper 95 percent confidence interval for metals in the soils of the conterminous United States as determined by Shacklette and Boerngen (1984) and as presented in the U.S. Geological Survey Professional Paper 1270. Fluoranthene, pyrene, and chrysene were detected at estimated levels below the instrument quantification limit in the SD-3 sample.

3.1.5.5 Chemical Characteristics of Air. At the Tri-Cities Barrel site, potential air releases were screened during the ES/D&M investigations using an HNU photoionization detector for organic contaminants. Use of an HNU as an ambient air quality monitoring tool gives general quantitative and no qualitative data. Therefore, the use of an HNU must be considered as a first step investigatory tool only to begin characterization of ambient air. No significant readings in ambient air were recorded during these screenings. In addition, an HNU photoionization detector was used to monitor the soil borings during past drilling operations to detect any potential release of organic contaminants to the environment. Based on a review of the Dames & Moore records for SS-3, HNU readings between 55 and 65 ppm were measured during advancement of the auger holes.

According to the WESTON Work Plan, during the WESTON site visits, odors were evident onsite, particularly in the area of the incinerator. These could have been due to surface contamination or drum residues volatilizing in response to solar heating. Based on the low levels of volatile organics found in soil samples (PCE (76 ug/kg), 1,1-DCA (6.3 ug/kg), trans-1,2-DCE (20 ug/kg), 1,1,1-TCA (17 ug/kg), and TCE (14 ug/kg), it appears that volatile organic air emissions emanating from the soil will be minimal. Therefore, it was proposed in the WESTON Work Plan that a worst case estimation of baseline air emission be calculated using the volatile organics soil data collected in Phase I of the RI/FS. A better estimate of determining the chemical characteristics of air is to measure emissions directly in the field rather than modeling the potential for emissions based on soil chemistry data. Not only does the existing data show very low levels of volatile organics (less than 150 ug/kg) but soil samples collected from depth may be inappropriate for estimating the air quality. As discussed in Section 5.3.1.11, air quality will be measured during the site investigation. The baseline air emission modeling proposed in the WESTON Work Plan is inappropriate and will not be performed until additional data is collected which indicates that it is warranted.

3.1.5.6 Chemical Characteristics of Biota. There are no existing data that characterize the nature, magnitude, and extent of contamination of biota situated at or around the site. Existing data collected from sampling of soil and groundwater indicate the presence of halogenated volatile organics at the site as previously discussed. Prior sampling of surface water and sediment from Osborne Creek revealed no organic substances in surface water and that only manganese and cobalt were the only metals that exceeded the typical range of metallic elements in surface soils, but were less than the upper 95 percent confidence interval for metals in soils. Additionally, manganese and cobalt have no appreciable toxicity potential. The available data suggest no appreciable impact potential to aquatic organisms at present and that biota sampling is not warranted at this time.

3.2 Preliminary Identification of Applicable or Relevant and Appropriate Requirements

This section provides a preliminary determination of the federal and state environmental and public health requirements that are applicable or relevant and appropriate to the Tri-Cities Barrel site. In addition, this section identifies other federal and state criteria, advisories, and guidance that could be used to evaluate remedial alternatives to be developed during the FS.

3.2.1 Definition of ARARS

Section 121(d)(2)(A) of CERCLA incorporates into law the CERCLA Compliance Policy, which specifies that Superfund remedial actions must meet any federal and state standards, requirements, criteria, or limitations that are determined to be legally applicable or relevant and appropriate requirements (ARARS).

The NCP (40 CFR Part 300/Federal Register, April 1990) and SARA define applicable requirements as those cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under federal or state law that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site.

Relevant and appropriate requirements are those cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under federal or state law that, while not "applicable" to a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site, address problems or situations similar to those encountered at the CERCLA site. In other words, requirements may be relevant and appropriate if they would be applicable except for jurisdictional restrictions associated with the requirements. With respect to the selection of remedial alternatives, relevant and appropriate requirements are to be afforded the same weight and consideration as applicable requirements.

ARARs may be divided into the following categories:

- Chemical-specific requirements are health or risk-based concentration limits or ranges in various environmental media for specific hazardous substances, pollutants, or contaminants. These limits may take the form of cleanup levels or discharge levels.
- Location-specific requirements are restrictions on activities that are based on the characteristics of a site or its immediate environment. An example would be restrictions on wetlands development.
- Action-specific requirements are controls triggered by specific remedial actions at the site (Note: added only to make clearer) such as hazardous waste management or wastewater treatment. An example would be RCRA incineration standards.

In addition to legally binding laws and regulations, many federal and state environmental and public health programs also develop criteria, advisories, guidance, and proposed standards that are not legally binding and do not have the status of potential ARARs. These To-Be-Considered (TBC) factors may provide useful information or recommended procedures. In some circumstances, however, TBCs will be considered concurrently with ARARs in determining the necessary level of remediation for protecting human health and the environment.

3.2.2 Consideration of ARARS during the RI/FS

Specifically, ARARs will be considered during the following activities of the RI/FS process:

- Scoping of the RI/FS: Identification of chemical-specific and location-specific ARARs on a preliminary basis.
- Site characterization and risk management phases of the RI: Identify chemical-specific ARARs and TBC material and location-specific ARARs comprehensively and use them to help determine cleanup goals.
- Development of remedial alternatives in the FS Report: Identify action-specific ARARs for each of the proposed alternatives and consider them along with other ARARs and TBC material.
- Detailed evaluation of alternatives: Examination of all the ARARs and TBCs for each alternative as a package to determine what is needed to comply with laws and regulations and whether or not compliance is expected.
- Selection of remedy: Selection of an alternative able to attain all ARARs unless one of the six statutory waivers is invoked.
- Remedial design: Insurance that the technical specifications of remedial construction attain ARARs.

As the RI/FS process continues, the list of ARARs will be updated continually, particularly as guidances are issued by the agencies. These will be used as a guide to establish the appropriate extent of site cleanup and will aid in scoping, formulating, and selecting proposed treatment technologies. They will also help govern the implementation/operation of the selected action. Primary consideration will be given to remedial alternatives that attain or exceed the requirements found in ARAR regulations. At each interval, ARARs will be identified and utilized by taking into account the following:

- Contaminants that may be present at the site
- Chemical analyses that will be performed
- Types of media that will be sampled
- Geology and other site characteristics
- Use of resources/media
- Levels of exposure and risk
- Potential transport mechanisms
- Purpose and application of the potential ARARs
- Remedial alternatives that will be considered for the site

3.2.3 Preliminary Identification of ARARS and TBCs

3.2.3.1 Potential Applicable or Relevant and Appropriate Requirements. The following federal and state regulatory requirements are potentially applicable or relevant and appropriate to the site:

(1) Chemical-Specific

- Federal:
  - Resource Conservation and Recovery Act (RCRA)-Maximum Concentration of Constituents for Groundwater Protection (40 CFR 264.94).

- Federal Safe Drinking Water Act-Maximum Contaminant Levels (MCLs) (40 CFR 141.11-.16, and .60-.63).
- National Ambient Air Quality Standards (NAAQSs; 40 CFR 50).

■ New York State:

- New York Groundwater Classifications, Quality Standards, and Effluent Standards and/or Limitations (6 NYCRR 703).
- New York Drinking Water Act Maximum Contaminant Levels (MCLs) (10 NYCRR 5).
- New York Surface Water Quality Standards (6 NYCRR 702).
- New York Raw Water Quality Standards (10 NYCRR 170.4).
- New York RCRA Maximum Concentration of Constituents for Groundwater Protection (6 NYCRR 373-2.6(e)).
- New York Ambient Air Quality Standards (6 NYCRR 256 and 257).

(2) Location-Specific

■ Federal:

- Protection of Floodplains, Wetlands (Executive Orders 11988 and 11990).
- Endangered Species Act (16 USC 1531 et seq.). (Requires that action be performed to conserve endangered species or threatened species).
- Fish and Wildlife Coordination Act (16 USC 661 et seq.). (Requires actions to protect fish or wildlife when diverting, channeling, or modifying a stream).
- Federal Water Pollution Control Act (FWPCA) (33 USC 1251 et seq.). (Requires a permit from the Corps of Engineers and consideration by both the USEPA and

the Fish and Wildlife Service before an application to dredge and fill may be enacted).

- Procedures for implementing the requirements of the Council of Environmental Quality (CEQ) for the National Environmental Policy Act (NEPA; 40 CFR Part 6, App A); action to avoid adverse affects, minimize harm, and preserve and enhance wetlands to the extent possible.

■ New York State:

- New York Floodplain Management Act and Regulations (ECL Article 36 and 6 NYCRR 500).
- New York Flood Hazard Area Construction Standards.
- Endangered and Threatened Species of Fish and Wildlife Requirements (6 NYCRR 182).

(3) Action-Specific

■ Federal:

- RCRA Criteria for Classification of Solid Waste Disposal Facilities and Practices (40 CFR 257).
- RCRA Standards Applicable to Generators of Hazardous Waste (40 CFR 262).
- RCRA Standards Applicable to Transporters of Hazardous Waste (40 CFR 263).
- RCRA Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities (40 CFR 264).
- RCRA Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities (40 CFR 265).

- RCRA Land Disposal Restrictions (40 CFR 268).
- Guidelines for Specification of Disposal Sites for Dredged or Fill Material (40 CFR 230).
- Clean Water Act - NPDES permitting requirements for discharge of treatment system effluent (40 CFR 122-125).
- Safe Drinking Water Act, Underground Injection Control Requirements (40 CFR 144 and 146).
- DOT Rules for Hazardous Materials Transport (49 CFR 107, 171.1-172.604).
- Occupational Safety and Health Standards and Safety and Health Regulations for Construction (29 CFR 1910 and 1926).

■ <u>New York State:</u>

- New York RCRA Rules for Siting Industrial Hazardous Waste Facilities (6 NYCRR 361).
- New York RCRA Hazardous Waste Manifest System and Related Standards for Generators, Transporters, and Facilities (6 NYCRR 372).
- New York RCRA Hazardous Waste Treatment, Storage, and Disposal Facility Permitting Requirements (6 NYCRR 373-1).
- New York RCRA Final Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities (6 NYCRR 373-2).
- New York RCRA Interim Status Standards for Owners and Operators of Hazardous Waste Facilities (6 NYCRR 373-3).

- New York Regulations on State Pollutant Discharge Elimination System (SPDES) (6 NYCRR 750-758).
- New York Air Emission Requirements (VOC Emissions from Air Strippers and Process Vents and General Air Quality) (6 NYCRR 200-212).

3.2.3.2 Potential "To Be Considered" Materials. When ARARs do not exist for a particular chemical or remedial activity or when the existing ARARs are not protective of human health or the environment, other criteria, advisories, and guidance may be useful in designing and selecting a remedial alternative. The following criteria, advisories, and guidance were developed by federal, state, and other agencies.

- Federal:
  - Safe Drinking Water Act-National Secondary Drinking Water Regulations (40 CFR 143).
  - Safe Drinking Water Act-Maximum Contaminant Level Goals (40 CFR 141.50-.52).
  - Proposed Safe Drinking Water Act-Maximum Contaminant Levels and Maximum Contaminant Level Goals (53 FR 31516).
  - Proposed Safe Drinking Water Act-Maximum Contaminant Levels, Maximum Contaminant Level Goals, and Secondary Maximum Contaminant Levels (54 FR 22064).
  - USEPA Quality Criteria for Water 1986, EPA 440/5-86-001, May 1986.
  - Proposed Federal Air Emission Control Standards for volatile organic control equipment (52 FR 3748).

- CERCLA (1980) as amended by SARA (1986) offsite policy (USEPA Directive 9834.11 and CERCLA Section and 121(d)(3)) and including the NCP developed under this Act (PL99-499).
- Proposed Requirements for Hybrid Closures(combined waste-in-place and clean closures) (52 FR 8711).
- Ecological Assessment of Hazardous Waste Sites: A Field and Laboratory Reference, March 1989, EPA/600/3-89/013.
- Risk Assessment Guidance for Superfund - Volume II - Environmental Evaluation Manual (Interim Final), March 1989, EPA/540/1-89/001.
- Protocols for Bioassessment at Hazardous Waste Sites (Porcella), 1983, EPA 600/2-83/054.
- Drinking Water Health Advisories. Office of Drinking Water, USEPA.
- Health Effects Assessment. Office of Health and Environmental Assessment. Environmental Criteria and Assessment Office, USEPA.
- Toxicological Profiles, Agency for Toxic Substances and Disease Registry, U.S. Public Health Service, Atlanta, GA.
- Policy for the Development of Water-Quality-Based Permit Limitations for Toxic Pollutants (49 FR 9016)
- Cancer Slope Factors. Human Health Assessment Group Office of Research and Development, USEPA.
- Groundwater Classification Guidelines under USEPA Groundwater Protection Strategy (USEPA 440/6-86-007).

- Groundwater Protection Strategy (USEPA 440/6-84-002).
- Waste Load Allocation Procedures.
- Fish and Wildlife Coordination Act Advisories.
- USEPA Record of Decision documents.
- USEPA policy for groundwater remediation at Superfund sites (Directive No. 9355.4-03).

■ New York State:

- New York Proposed Safe Drinking Water Standards Maximum Contaminant Levels for VOCs (10 NYCRR 5).
- New York Underground Injection/Recirculation at Groundwater Remediation Sites (Technical Operating Guidance (TOG) Series 7.1.2).
- New York Analytical Detectability for Toxic Pollutants (85-W-40 TOG).
- New York Toxicity Testing Permit Program (TOG 1.3.2).
- New York Regional Authorization for Temporary Discharges (TOG Series 1.6.1).
- New York Air Guidelines for the Control of Toxic Ambient Contaminants (Air Guide 1).
- New York State Department of Environmental Conservation, Division of Fish and Wildlife, Sediment Criteria Document (December 1989).

■ Other:

- World Health Organization Guidelines.

3.3 Preliminary Risk Assessment

The preliminary risk assessment provides some insight into the problems that may be posed by contaminants found at the site. The areas of concern are those associated with risks to humans and wildlife living on or near the site or otherwise coming in contact with contaminants that are site-related. Using the available sampling data, a brief assessment of potential risks is presented in the following subsections.

3.3.1 Potential Contaminants of Concern

Phase II (ES/D&M) groundwater sampling revealed the presence of several contaminants in one of the downgradient wells. The contaminants and their concentrations were:

- Trans-1,2-dichloroethene - 17 ppb
- Trichloroethene - 10 ppb
- Bis (2-ethylhexyl) phthalate - 24 ppb
- 1,1-Dichloroethane - 9.2 ppb
- 1,1,1-Trichloroethane - 12 ppb
- Toluene - 6.8 ppb
- Phenol - 5.3 ppb
- Butylbenzylphthalate - 4.6 ppb
- Chlordane - 3.8 ppb
- Aroclor 1242 - 2.9 ppb

Analysis of surface water samples taken from a seasonal stream on the eastern boundary of the site which joins Osborne Creek, approximately 800 feet offsite, revealed minor PAH contamination. No organic contaminants were noted in Osborne Creek water samples. The metal noted in surface water at an elevated level was sodium, collected at the downstream Osborne Creek location. A major highway is located near the stream, and salt used for snow and ice removal from the highway may be a potential cause for the elevated sodium levels.

Sediment sampling was performed both in the seasonal stream leaving the site and in Osborne Creek. No organic contaminants were found in the sediment samples. Two inorganics (manganese and cobalt) were found in Osborne Creek sediments at concentrations above the typical range of metallic elements in surface soils, but at concentrations below the upper 95 percent confidence interval for metals in soils (Shacklette and Boerngen 1984).

Soil samples were collected on the site. The substances found (primarily in a single soil boring) included tetrachloroethene (76 ppb), 1,1-dichloroethene (6.3 ppb), trans-1,2-dichloroethene (20 ppb), 1,1,1-trichloroethane (17 ppb), trichloroethene (14 ppb) and manganese (1,230,000 ppb).

Air sampling consisted of screening total organic vapors in ambient air using an HNU photoionization detector. No notable elevation of vapor content in air was reported.

The results of the initial sampling that was performed at Tri-Cities Barrel, are shown in Table 3-9.

3.3.2 Potential Sources of Contamination

Drums were reclaimed at the Tri-Cities Barrel site. A wide variety of residual contaminants could have been present in drums sent to the facility for reconditioning, therefore almost any contaminant could be present at the site. Residual contamination in any given drum would be a small quantity, but tens of thousands of drums reconditioned over the years might have resulted in the accumulation of substances

Table 3-9

Results of Inital Sampling at the Site

Concentration (ppb)

Substance	Soil	Groundwater	Surface Water	Sediments	Air
Bis (2-ethylhexyl)-phthalate	-	24	-	-	-
1,1-Dichloroethane	-	9.2	-	-	-
1,1-Dichloroethene	6.3	-	-	-	-
t-1,2-Dichloroethene	20	17	-	-	-
Tetrachloroethene	76	-	-	-	-
1,1,1-Trichloroethane	17	12	-	-	-
Trichloroethene	14	10	-	-	-
Toluene	-	6.8	-	-	-
Manganese	1,230*	-	-	1,200*	-
Cobalt	22.9*	-	-	20.1*	-
Aroclor 1242		2.9	-	-	-
Benzo (a) pyrene	-	1.9J	-	-	-
Butylbenzylphthlate	-	4.6	-	-	-
Chlordane	-	3.8	-	-	-
Di-n-butylphthalate	-	3.0	-	-	-
Phenol	-	5.3	-	-	-
Vinyl Chloride	-	6.5	-	-	-

*Unit of measure is mg/kg.
J = Concentration is less than instrument quantification limit estimate.

in soil and groundwater. The presently available data do not suggest gross contamination by these substances, however.

Wastewater was originally directly discharged to the ground. In the early 1960s, a series of lagoons between the plant and Osborne Creek were constructed. When I-88 was built, the configuration of lagoons changed, and two (later three) lagoons were constructed just north of the building, with overflow into the western stream. The primary sources of contamination at the site could be those lagoons, the area around the incinerator, and any surface soil in drum handling areas.

3.3.3 Potential Exposure Pathways and Receptors

There appear to be several potential pathways for exposure at the site. The site is not secured, and trespassers, human and animal, could enter the site, thus creating the potential for direct contact with soils. There are also two intermittent streams that may channel site contaminants into nearby Osborne Creek. In addition, the initial soil and groundwater sampling indicate the presence of volatile organics, suggesting a possible inhalation pathway. Residential use of the area groundwater would constitute a potential pathway of exposure.

There are homes located in the immediate vicinity of the site. Since the site is not secured, the potential exists for trespassing by area residents, particularly children. Other potential receptor activities include gardening by local residents and their use of the groundwater to grow vegetables. Because of the proximity of Osborne Creek, recreational use of the creek and the seasonal streams for swimming, wading, and fishing present possible exposure pathways. Use of the groundwater for drinking and other household uses is another possible pathway. Residents living near the facility could be exposed to volatile organic contaminants entering the air from the soil and from windblown soil from the site (metals/semi-volatiles).

A potential pathway/exposure matrix for the Tri-Cities Barrel site is presented in Table 3-10.

Table 3-10

Potential Pathway/Exposure Matrix For Tri-Cities Barrel Site

Pathway	Exposure Route
Air	Inhalation exposure to nearby residents via vapors and dust. Inhalation exposure to trespassers via vapors and dust.
Groundwater	Use of water for drinking and other household uses. Use of water for irrigation.
Surface soils	Direct dermal contact by trespassers. Incidental ingestion by trespassers. Growth of plants consumed by wildlife. Direct contact by wildlife/food chain.
Surface water	Direct contact by children. Accidental ingestion by children. Ingestion of fish from Osborne Creek. Ingestion of water by area wildlife/food chain.
Sediments	Direct contact by children. Incidental ingestion by children. Direct contact by area wildlife (primarily benthos)/food chain.

The final choice of exposure scenarios to be included in the baseline risk assessment will be based on the results of the RI. Scenarios such as inhalation of vapors, use of groundwater for irrigation, growth of plants consumed by wildlife (soils scenario), direct contact with soils by wildlife/food chain, and all of the scenarios listed in Table 3-10 for surface water and sediments may not be appropriate after the RI data have been gathered and analyzed.

3.3.4 Preliminary Exposure Assessment

Of the identified substances that might prove to be site-related (Table 3-9), at least ten possess carcinogenic properties. A preliminary assessment of risk potential could be performed, but the results would have no utility in the RI/FS process until further sample data are collected. When Phase I sampling is complete, a preliminary assessment will be performed to assist in focusing further sampling efforts or in determining that data are sufficient to characterizing the medium sampled.

3.3.5 Summary of Additional Data Needs

The limited preliminary data describing offsite surface water and sediment quality suggest that site-related activities have not impacted the aquatic environment in the vicinity of the site. Further sampling of the two drainage ditches that receive surface runoff from the site or might be influenced by groundwater seeps and sampling of Osborne Creek are appropriate to determine whether there is any potential for contaminant migration to Osborne Creek and downstream of the site. If the results of the surface water and sediment sampling of the ditches during the Phase I investigation indicate the presence of site-related substances, additional sampling in the vicinity where contaminants are detected and downgradient sampling will be performed to identify the extent of site-related substances. Sampling of fish from Osborne Creek will be appropriate only if the results of surface water and sediment samples taken from Osborne Creek indicate the presence of site-related substances and a quantitative evaluation of bioconcentration potential in the fish suggests that either the fish or users of the fish (human or wildlife) might be adversely affected.

Data from limited sampling of site soils also suggest that the potential threat to humans or wildlife is minimal; however, additional onsite sampling is appropriate to ensure that the results of the preliminary risk assessment reflect the true quality of the site soils. If the results of the Phase I investigation indicate the presence of contamination, then additional sampling of site soils will be phased to efficiently characterize the extent of the site-related contamination. Surficial soil sample data are of primary importance to risk assessors, for that is the zone that is most likely to be contacted by humans or wildlife. Subsurface soil quality is of relevance, however, and any subsurface samples collected to characterize the nature, magnitude, and extent of contamination will be evaluated in the risk assessment.

There were several substances detected in the limited sampling of existing wells that could affect the health of users of the groundwater. Of particular concern was the detection of vinyl chloride, Aroclor 1242, chlordane, phenols, and bis(2-ethylhexyl)phthalate at concentrations that contributed to the calculated risk potential in the preliminary risk assessment. The named substances represent the volatile and semi-volatile organic compounds as well as the pesticides and PCBs. To further evaluate if these compounds are site-related, analysis for the Target Compound List (TCL) and Target Analyte List (TAL) substances will be conducted for all soils and water as recommended in the Phase I investigation.

Groundwater will be sampled to investigate the potential risk and confirm the previous results, and if necessary, expand the investigation of that medium so that risk potential can be more accurately characterized. The location of any additional wells necessary to characterize the nature, magnitude, and extent of contamination of the underlying aquifer and the resulting risk potential will be decided after a more thorough investigation of site soils is performed. The identification of contaminant sources in the soil will influence the placement of additional wells. Proper placement of wells allows for better correlation between possible sources in soil and groundwater quality, and therefore allows for a more meaningful evaluation of risk potential for both media. The limited soils data collected at the site indicate the presence of volatile organic substances. At the low parts-per-billion concentrations detected, there would be little concern in regard to inhalation exposure of onsite or offsite receptors. The data resulting from additional soil sampling collected during the Phase I investigation and ambient air monitoring for VOCs during excavation activities will be useful in evaluating whether vapor emissions from soil are of any concern at the site. A comprehensive assessment of air quality at the site will be appropriate if the results of Phase I of the RI suggest that inhalation of vapors at the site is of significance to the risk assessment.

Additional data needed to support a risk assessment include the collection of background samples from each medium sampled so that meaningful comparisons of site sample data with that of the area background may be made. Background sample data are most needed for determining whether naturally occurring substances such as metals are associated with site activities or whether their presence is simply within the area's natural concentration range.

To a more limited extent, certain organic substances such as PAHs may also be naturally occurring. For example, the Agency for Toxic Substances and Disease Registry (ATSDR) stated in their draft toxicological profile for PAHs that they are formed during volcanic eruptions and forest fires. Nevertheless, the USEPA has not made provisions in the risk assessment process to eliminate organic substances based on background comparisons unless there is evidence to prove that the substances are not site-related.

3.4 Preliminary Identification of Remedial Action Alternatives

3.4.1 Preliminary Identification of Remedial Action Objectives

Remedial action objectives consist of medium-specific or operable unit-specific goals for mitigating the risks to public health and environmental quality from the site. For example:

- Groundwater - Prevent or reduce human exposure to untreated, contaminated groundwater such that the excess risk from exposure is within acceptable levels.
- Surface water/sediment - Prevent or reduce human exposure to contaminated surface water and sediment such that the excess risk from exposure is within acceptable levels.
- Soil - Prevent or reduce human exposure to contaminated soil such that the excess risk from exposure is within acceptable levels.
- Air - Prevent or reduce human exposure to contaminated air released from contaminated areas onsite or from remedial measures implemented such that the excess risk from exposure is within acceptable levels.

The remedial action objectives will be based on site-specific conditions such as contaminant types and media of concern, exposure pathways, results of the risk assessment, and ARARs. The remedial action objectives are developed in compliance with the NCP to ensure that remedial designs meet all applicable regulatory standards, protects current and potential future human health, and protects the environment (i.e., prevents or reduces the potential of fish and wildlife exposures). These objectives will be used to screen remediation alternatives developed in the FS.

3.4.2 Preliminary Identification of General Response Actions, Remedial Technologies, and Alternatives

To achieve the preliminary remedial response objectives set forth in Subsection 3.4.1, a set of general response actions is identified for the site. These general response actions fall into the following categories:

- No action.
- Source control actions.
- Migration control actions.

A preliminary list of response actions and remedial alternatives for specific media is presented in the following section. This preliminary list of response actions and remedial alternatives is intended to provide a starting point for the FS. More specific response actions will be developed during the remedial investigation, followed by further development of alternatives, screening of alternatives, and detailed analysis of alternatives as discussed in Subsection 5.9.

3.4.2.1 Soil Treatment and Disposal. The remediation of contaminated soils at the site can be addressed by either excavation and onsite or offsite treatment/disposal, or in-situ treatment. Table 3-11 provides an initial summary of potentially applicable technologies/alternatives for contaminated soils at the site.

3.4.2.2 Groundwater Treatment and Disposal. Contaminated groundwater at the site can be pumped and treated onsite or treated in situ as summarized in Table 3-12.

3.4.2.3 Underground Tanks. The underground storage tanks associated with the active gasoline pumps are the responsibility of the owner pursuant to Section 101(14) of CERCLA which specifically excludes oil from regulation under CERCLA. No investigations will be conducted during the RI related to the underground storage tanks; therefore, no remedial technologies are presented.

3.5 Need for Treatability Studies

In order to perform a comprehensive evaluation of the technical feasibility and effectiveness of certain remedial technologies, it may be necessary to conduct laboratory and bench-scale treatability studies. These technologies will include those for which sufficient data are not available in the literature (i.e., innovative technologies) or those which depend on site-specific contaminants and waste stream composition. Treatability studies, if performed, will include the researching of applicable data, designing of the study, procurement of vendors/equipment, and pilot testing as appropriate for the remedial technology.

Table 3-11

Preliminary Identification Of Potentially Applicable
Remedial Technologies/Alternatives For Contaminated Soil

Response Action	Remedial Technologies/Alternatives	Possible Data Requirements
No Action	• Fences/Warning Signs	• Risk Assessment
	• Groundwater Monitoring	• Groundwater and Surface Water Data
	• Surface Water Monitoring	
	• Deed Restriction	
	• Institutional Controls	
		• Geohydrological Data
Containment	• Cover System	• Geotechnical Data
	• Low Permeability Barrier	• Soil Characterization
		• Parameters
Treatment	<u>Excavation/Onsite Treatment</u>	- Size
	• Volatiles	- Minerology
	- Mechanical/Thermal Aeration	• Bench-Scale/Pilot Plant
	- Incineration	• Treatability Studies
	- Low Temperature Thermal Treatment	• Volume of Soils
		• Regulatory Requirements
	- Biological Treatment	• Identification of Available Landfill
	• Semi-Volatile Organics	
	- Soil Washing	
	- Incineration	
	- Biological Treatment	
	• Metals	
	- Chemical Fixation	
	- Soil Washing	
	- Roasting (Thermal Immobilization)	
	<u>Excavation/Offsite Treatment</u>	
	• Offsite Treatment	
	• Some technologies for onsite treatment should be considered.	
	<u>In-Situ Treatment</u>	
	• Soil Flushing	
	• Fixation	
	• Bioreclamation	
	• In-Situ Volatilization	
	• Encapsulation	
Disposal	• Onsite Disposal	
	• Offsite Disposal	

Table 3-12

Preliminary Identification Of Potentially Applicable Remedial Technologies/Alternatives For Contaminated Groundwater

Response Action	Remedial Technologies/Alternatives	Data Requirements
No Action	• Groundwater Monitoring	• Risk Assessment
	• Institutional Controls	• Groundwater Characterization
Treatment	• Pump and Onsite Treatment	• Treatability Studies
		• Aquifer Characteristics
	• Volatiles - Air Stripping - Chemical Oxidation - Carbon Adsorption	
	• Semi-Volatile Organics - Carbon Adsorption - Chemical Oxidation - Biological Treatment - Reverse Osmosis - Biodegration	
	• Metals - Chemical Precipitation - Ion Exchange - Reverse Osmosis - Reduction Precipitation - Suspended Solids Removal	
	• In-Situ Treatment - Bioreclamation (Organics Only) - Air Sparging (Organics Only)	
Disposal	• Recharge to Groundwater	
	• Storm Sewer	
	• Sanitary Sewer	
	• Discharge to Surface Water	
	• Solids Disposal (Onsite/Offsite)	

Based on available site characterization data and the list of potentially applicable technologies, treatability studies cannot be identified in an effective manner at this time. As additional data are gathered during the RI/FS process and the remedial response objectives and potentially applicable remedial technologies are revisited, certain promising technologies may be identified for bench-scale or full-scale treatability studies.

4.0 Work Plan Rationale

Based on the initial evaluation presented in Section 3, a rationale has been developed for the RI/FS for the Tri-Cities Barrel site. The Work Plan rationale is presented in the following subsections:

- 4.1 - Preliminary Conceptual Understanding of the Site
- 4.2 - Work Plan Approach
- 4.3 - Data Quality Objectives

4.1 Preliminary Conceptual Understanding of the Site

The conceptual understanding of the Tri-Cities Barrel site consists of potential sources of contamination and potential migration/exposure pathways as identified in the initial evaluation. The potential sources of contamination at the site are primarily the backfilled lagoons, the drum storage areas, past spillage of barrel residues from barrel handling operations, the sump located inside the facility building, the septic tank, and the incinerator.

The potential migration pathways for contaminants from the lagoons are infiltration to groundwater and potential groundwater discharge to surrounding surface water bodies. The migration of contaminants from the lagoons depends on factors such as chemical/physical properties of contaminants, geology and hydrology, and soil characterization.

The potential migration and exposure pathways for the past spillage of barrel residues from the barrel handling operations and the ashes from the incinerator include direct contact, surface transport, volatilization/wind transport, infiltration to groundwater.

The migration of contaminants via these pathways from past spillage of barrel residues and the ashes from the incinerator depends on factors such as chemical/physical properties of contaminants, site geology and hydrogeology, soil properties, site topography, climate condition.

4.2 Work Plan Approach

The basic technical approach to the RI/FS at the Tri-Cities Barrel site involves characterizing the site to a point at which remedial alternatives can be developed and evaluated. ESC will:

- evaluate existing data and conduct literature reviews for background information
- conduct an investigation of the building interior and exterior
- excavate exploratory trenches in the suspected areas of concern to obtain information on potential source areas
- select optimum sampling locations for chemical analysis
- perform ambient air monitoring for VOCs during excavation activities
- collect shallow hand augered soil samples in areas where trenching is not feasible or considered inappropriate
- collect shallow soil samples in the areas affected by the 1958 drainage pattern, in the former drum storage south of Osborne Hollow Road, and in background locations
- collect deep soil samples from the piezometer boreholes
- resample the existing groundwater monitoring and process water wells
- evaluate the potential for the presence of contamination north of I-88
- collect surface water and sediment samples from the western and eastern drainage ditches

- collect surface water and sediment samples from Osborne Creek and the pond north of I-88
- determine the direction of groundwater flow

Sampling local wells and developing a groundwater survey was eliminated because previous sampling results were below detection and offsite groundwater contamination has not been documented. Once the identification and characterization of source areas has been conducted and the direction of groundwater flow determined, the need for the installation of soil borings and monitoring wells will be evaluated and the US EPA and NYSDEC will be consulted when making these decisions. The geophysical survey is also unnecessary at this time because a similar electrical resistivity and magnetometer survey was previously conducted at the site.

Once all source areas are characterized, a focused sampling program will be developed, as warranted, in a manner consistent with the NCP. Based on the results of Phase I of the RI, additional investigations (such as the installation and sampling of groundwater monitoring wells) will be conducted. As discussed in Section 5.3.7, existing data and data collected during the Phase I investigation will be evaluated and the US EPA and NYSDEC will be consulted to develop the scope of Phase II activities.

As discussed in Section 6.0 Project Schedule, this approach will not extend the project schedule beyond that previously proposed in the WESTON Work Plan, but rather as proposed in Section 6.0 will shorten it.

The site characterization activities at the Tri-Cities Barrel site will be categorized as:

- Source characterization
- Contaminant migration characterization
- Site environmental characterization

The source characterization activity of the investigation is presented in this Work Plan and is considered to be the first phase (Phase I) of the RI. Reevaluation of existing data and a supplemental paper review, and extensive sampling and testing of soils, surface water, sediments, and building materials are included in this Phase of the investigation for the purpose of identifying the source areas and determining the need for further investigation.

The contaminant migration characterization will consist of activities designed to evaluate the extent of migration from the source areas. These activities will include the installation of additional monitoring wells and soil borings in Phase II, as needed, to assess the extent of contamination.

The site environmental characterization will be developed concurrent with the contaminant migration characterization and will assess specific conditions that may affect the nature and extent of contamination and the development and evaluation of potential remedial alternatives.

These general areas of site characterization are briefly described in the proposed tasks/activities in Table 4-1. The scope of work described in Section 5 includes these three general areas of site characterization.

4.3 Data Quality Objectives

Data Quality Objectives (DQOs) are qualitative and quantitative statements, the application of which ensures that data generated during the RI are adequate to support the objectives of the project. DQOs are based on the intended use of the data and are specified for each data collection activity. Different levels of data quality are defined as the degree of uncertainty as the data varies with respect to precision, accuracy, and completeness. The levels are assigned based on data use, analytical requirements, and data quality. Table 4-2 summarizes the analytical levels appropriate to the data proposed uses.

For remedial investigations involving the collection of soil, groundwater, surface water, sediment, and building samples at Tri-Cities Barrel, DQOs will be based on the media-specific ARARs developed

Table 4-1
Work Plan Approach
To Site Characterization

Categories	Description	Activities
Source Characterization	Assess the type and volumes of potential sources of contamination	Consistent with Section 5.3.3, the source characterization will include the following activities: evaluate site operations, dig exploration trenches, collect surface and subsurface soil samples, collect groundwater samples from existing monitoring wells, install groundwater piezometers, collect surface water and sediment samples, and evaluate existing data.
Contaminant Migration Characterization	Assess nature and extent of contaminant migration in various media including air, surface water, groundwater, soils, and sediments.	Further site investigation as appropriate which may include groundwater investigation, surface water investigation, air monitoring, sediment investigation, geophysics, soil gas, and soil sampling.
Site Environmental Characterization	Assess site specific conditions that may affect the nature and extent of contamination and the development and evaluation of potential remedial alternatives.	Concurrent with contaminant migration characterization which would use information pertaining to site geology, site hydrogeology, site physical features, ecological assessment, human population, and land use.

Table 4-2

Summary of Analytical Levels Appropriate to Data Uses

DATA LEVEL	DATA USES	ANALYTICAL LEVEL	TYPE OF ANALYSIS	LIMITATIONS	DATA QUALITY
SCREENING	- Health and Safety Monitoring - Site Characterization - Engineering Design	Level I	- Total Organic/Inorganic vapor detection using portable instruments - Field test kits	- Instruments respond to naturally-occurring compounds	- If instruments calibrated and data interpreted correctly, can provide indication of contamination and locate areas needing sample analysis
Field Analysis	- Risk Assessment - Site Characterization - Evaluation of Alternatives - Engineering Design - Monitoring During Implementation	Level II	- Variety of organics by GC; mobile lab generated - Tentative ID; analyte-specific - Detection limits vary from low PPM to low PPB	- Tentative ID - Techniques/instruments limited mostly to volatiles	- Dependent on QA/QC steps employed - Data typically reported in concentration ranges
Engineering	- Assessment - Site Characterization - Evaluation of Alternatives - Engineering Design - Monitoring during implementation	Level III	- Mobile lab generated - Organics/inorganics using EPA procedures other than CLP can be analyte-specific - RCRA characteristic tests	- Tentative ID in some cases can provide data of same quality as levels IV, NS	- Similar detection limits to CLP - Less rigorous QA/QC
Confirmational	- Risk Assessment - Evaluation of Alternatives - Engineering Design - Cost Recovery	Level IV	- TCL and TAL organics/ inorganics by GC/MS; AA; ICP - Low PPB detection limit	- Tentative identification of non- TCL and TAL parameters - Some time may be required for validation of packages	- Goal is data known quality - Data validation - Rigorous QA/QC
Non-Standard	- Risk Assessment	Level V	- Non-conventional parameters - Method-specific detection limits - Modification of existing methods	- May require method development/modification - Mechanism to obtain services requires special lead time	- Method-specific

for the site. Samples will be collected and analyzed using EPA-approved analytical methods at "Analytical Level IV," according to Table 4-2.

The analytical and sampling data gathered at the site during previous investigations will be reviewed and evaluated to determine its usability. This evaluation will be based on the quality of data produced and its adequacy for use in the RI.

The DQOs outlined above will be further defined during the preparation of the Quality Assurance Project Plan (QAPP) as a portion of the Sampling and Analysis Plan (SAP). These plans will ensure the appropriate methods are used during the remedial investigation to meet the DQOs.

5.0 RI/FS Scope of Work

Per OSWER Directive 9355.3-01, "Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA, all RI/FS work tasks are to be broken down into 15 standard subtasks. The standard tasks for an RI/FS, and their corresponding section identifications within this Work Plan, are as follows:

Standard Tasks		Work Plan Section
1	Project Planning	5.1
2	Community Relations	5.2
3	Field Investigation	5.3
4	Sample Analysis/Validation	5.4
5	Data Evaluation	5.5
6	Assessment of Risks	5.6
7	Treatability Studies/Pilot Tests	5.7
8	Remedial Investigation Reports	5.8
9	Remedial Alternatives Screening	5.9
10	Remedial Alternatives Evaluation	5.10
11	Feasibility Study Reports	5.11
12	Post RI/FS Support	5.12
13	Enforcement Support	5.13
14	Miscellaneous Support	5.14
15	ERA Planning	5.15

The OSWER Directive provides task names for utilization in the organization of the RI/FS process in order to assure as much consistency as possible in the way individual RI/FS efforts are tracked under Superfund. When necessary to accurately define the scope of work, ESC has added additional subtasks, while retaining the original 15-task work breakdown structure (WBS).

In this Work Plan, the subtask headings presented by WESTON have been retained although several sections have been either combined with other subtasks, reduced in scope, or deleted. The rationale for changes to these subtasks is presented below in the text associated with each subtask. A revision to Volume II (cost estimates) has not been prepared as part of this submittal and is not included with this Work Plan.

5.1 Task 1 - Project Planning

The Project Planning task of the Tri-Cities Barrel RI/FS proposed in the WESTON Work Plan is made up of 18 subtasks.

5.1.1 Kick-Off Meeting

A preliminary meeting was held with representatives of the participating parties, ESC, and the USEPA in USEPA Region II Headquarters on July 25, 1991, to discuss the general approach to modifying the draft Work Plan prepared by WESTON for the Tri-Cities Barrel RI/FS. The historical activities of the site were reviewed as was the approach to modifying the WESTON Draft Work Plan and submitting the Work Plan prepared by ESC to the USEPA. Other items discussed included the rationale and conceptual approach for conducting the Phase I Investigation presented in this Work Plan and the need for future coordination regarding the project schedule and timely presentation of field data to the agencies for review.

An informal meeting was also held with representatives of the participating parties, ESC, USEPA, NYSDEC, and Roy F. Weston in USEPA Region II Headquarters on July 30, 1992, to discuss the August 28, 1991, Draft Revised Work Plan prepared by ESC. Work Plan (Revision No. 4) was revised based on the discussions of the meeting.

Based on the discussions at these meetings, it is anticipated that periodic meetings will be held with the USEPA and NYSDEC to provide verbal progress reports, review analytical data available at the time of the meeting, and develop an ongoing interactive scoping process for successive phases of work.

5.1.2 Site Visit

A site visit was held on 2 July 1991, by the participating parties as part of a pre-bidders conference to review the WESTON Work Plan. During the site visit, a walk-through of the facility was conducted and the site operations described. Representatives from ESC were present at the site visit and information obtained was incorporated into the development of this Work Plan.

5.1.3 Easements/Permits

No permits or easements have been necessary to date. However, it is anticipated that permits or easements may be necessary during the RI. Permits/easements that may be necessary include:

- Access from I-88 to the northern portion of the site
- Access agreement to neighboring properties for surface water, sediment, and surficial soil sampling

5.1.4 Site Reconnaissance

A preliminary site reconnaissance was conducted by WESTON on May 9, 1990. Areas with stained soils and stressed vegetation were mapped to aid in siting monitor wells and soil borings proposed in the Draft WESTON Work Plan. Information was also gathered to produce the preliminary site surficial geology map. According to the WESTON Work Plan, the pond/lagoon north of I-88 was manmade. Two areas were found where buried drums were exposed on partially eroded slopes along the northern edge of the fill and where the western stream has exposed drums. Buried drums were not evident during the July 1991 site visit. The preliminary site reconnaissance conducted by WESTON also included a visit to the local Tax Map Information office in Binghamton, New York.

ESC will conduct a site reconnaissance to verify observations made by WESTON and to evaluate closely the potential source areas associated with the facility operations. In addition to evaluating the geologic features and confirming the absence of wetlands at the site, an evaluation of the past waste handling operations at the facility will be reviewed. Special emphasis will be placed on identifying the historical operations which may have resulted in contamination to the surface and subsurface. Features identified during the site visit such as the sump located inside the building and the septic tank southwest of the building will be evaluated to assess these locations as possible source areas. Additionally, the section of Osborne Creek that borders the site will be inspected for evidence of dredging. Information obtained during this task will be used to guide the field investigation.

5.1.5 Review of Existing Aerial Photographs

Existing aerial photographs were reviewed by WESTON at the NYSDOT and Soil Conservation Service offices. Several of these photographs were ordered by WESTON from appropriate sources. The review of historic aerial photographs from the years 1948, 1958, 1968, 1973, and 1982 revealed the existence of a number of former wastewater lagoons and identification of additional drum storage areas. As a result of these activities, WESTON increased the site area from 3.5 to approximately 13 acres in size after consultation with and approval of the EPA.

The aerial photographs available in the existing file and the aerial photographs compiled by the EPA's Environmental Photographic Interpretation Center (EPIC) will be examined. In addition, a search for aerial photographs available from sources other than the NYSDOT, Soil Conservation Service, and

EPA's EPIC will be conducted to obtain more information about the possible activities associated with the pond located north of I-88 and dredging of Osborne Creek. Attempts will also be made to interview NYSDOT personnel or workers involved with the construction of I-88 and to interview Army Corps of Engineers and NYSDEC personnel who may have knowledge of dredging of Osborne Creek.

5.1.6 RI/FS Brainstorming

As described in Section 5.1.1, it is anticipated that regular meetings will be held with regulators to discuss project activities and progress and technical issues. In addition, regular meetings with the project team conducting the work will be held.

5.1.7 Existing Data Review

In the preparation of this Work Plan, the following existing data review activities were performed by WESTON:

- USEPA Region II, New York, New York office, file review and data collection
- NYSDEC, Kirkwood, New York office, file review and data collection
- Collection and review of ARARs
- Local tax office files review
- Collection and review of geologic information
- Review of existing aerial photographs
- Collection and review of environmental setting information
- Meeting with the site owner, Mr. Gary Warner
- Site reconnaissance
- Interview with long-time residents

- Broome County Health Department interviews
- State Health Department interviews
- NYSDOT records search on I-88 construction

WESTON included a discussion of the existing data believed relevant in Subsection 3.1 of the January 1991 Work Plan. ESC will obtain copies of the available information listed above and review it as part of the RI process.

5.1.8 Preliminary Remedial Alternative Identification

A preliminary identification of remedial alternatives has been performed. A discussion of issues and criteria related to preliminary alternative identification is presented in Subsection 3.4 of this Work Plan.

5.1.9 Preliminary Risk Assessment

A preliminary risk assessment will be performed following implementation of the Phase I investigation. Using the data collected during the Phase I investigation, this preliminary risk assessment will expand on the preliminary risk assessment presented in Section 3.3. As stated in Section 3.3.4, when Phase I sampling is complete, a preliminary assessment will be performed to assist in focusing further sampling efforts or in determining that data are sufficient to characterizing the medium sampled. Results of the preliminary risk assessment will be used to develop the scope of work for Phase II of the RI.

5.1.10 Preliminary ARARs Identification

A preliminary identification of ARARs has been performed and is presented in Subsection 3.2 of this Work Plan.

5.1.11 RI Scoping

RI scoping involves the process by which specific approaches to the field investigation (Subsection 5.3), sample analysis/validation (Subsection 5.4), and data evaluation (Subsection 5.5) are formulated and proposed. These and other sections of this Work Plan represent the results of preliminary RI scoping. Meetings with the USEPA and other involved agencies (NYSDEC) are anticipated during this process, especially during the scoping of Phase II of the RI.

5.1.12 Work Plan Preparation

The overall objective of the phased approach presented by this work plan is to assess the nature and extent of site contamination at or emanating from the site. Phase I will attempt to assess the source areas. Data will be gathered during the Phase I Investigation to evaluate the potential contamination of property beyond the 3.5-acre former operating site boundaries. This Work Plan addresses Phase I of the RI in detail and presents the possible activities that may be implemented during Phase II of the RI.

This Work Plan has been prepared by ESC in accordance with applicable guidance documents. The Work Plan consists of one volume which describes the background information and scope of work for the proposed RI/FS for this site. Because this work is being conducted by the participating parties, a separate volume which contains detailed cost information has not been included.

5.1.13 Sampling and Analysis Plan Preparation

As part of the Project Planning task of this work assignment, a Sampling and Analysis Plan (SAP) will be prepared. Preparation of the SAP will consist of the preparation of the Field Sampling Plan (FSP) and the Quality Assurance Project Plan (QAPP; discussed in Subsection 5.1.15). The FSP will present the sampling and data gathering methods on a task-by-task basis for Phase I of the RI. Addenda to the

FSP will be prepared for subsequent RI activities, if required by the USEPA. Guidance documents that will be consulted in the preparation of the FSP include:

- Compendium of Superfund Field Operations, September 1987
- Test Methods for Evaluating Solid Waste - Physical/Chemical Methods (SW-846)
- RCRA Groundwater Monitoring Technical Enforcement Guidance Document, September 1986

The FSP typically consists of six elements, including:

- Site background and setting
- Sampling objectives
- Sample location and frequency
- Sample designation
- Sampling equipment and procedures
- Sample handling and analysis

5.1.14 Health and Safety Plan Preparation

A comprehensive Health and Safety Plan (HASP) will be prepared for the Tri-Cities Barrel site. The HASP will define specific procedures and protocols that will be implemented to ensure the health and safety of all personnel during field activities. Community health and safety will be addressed according to site needs and appropriate guidance documents. Any visitors to the work location will also be asked to adhere to health and safety protocols while onsite. Any deviations from the HASP or program will be noted. Every subcontractor procured to perform services onsite will be required to comply with the HASP. All field activities will comply with 29 CFR 1900 to 1920.

In general, the HASP will be developed based on the following:

- OSHA 29 CFR 1900 to 1920
- USEPA Environmental Response Team operating guidelines
- OSHA/NIOSH/USEPA/Coast Guard "Occupational Health and Safety Guidelines for Activities at Hazardous Waste Sites"
- NIOSH Pocket Guide to Chemical Hazards
- (ACGIH) Threshold Limit Values for 1985 through present

5.1.15 Quality Assurance Project Plan Preparation

As part of the Project Planning task of this work assignment, a QAPP will be prepared. The QAPP will describe the project procedures to assure that the data quality objectives presented in the RI/FS Work Plan are met during the implementation of the RI. Additionally, the QAPP will define the project team with regard to organization and responsibility and specify the corrective measures to be taken during implementation of the RI when nonconformances occur. The following guidance documents will be used in the development of the QAPP:

- Interim Guidelines and specifications for Preparing Quality Assurance Project Plans - QAMS - 005/80
- Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA - USEPA/540/G-89/004
- USEPA Region II CERCLA Quality Assurance Manual

The elements of the QAPP are presented in Table 5-1.

5.1.16 Data Management Plan Preparation

In accordance with OSWER Directive 9355.3-01, a Data Management Plan will be prepared for the Tri-Cities Barrel site as one of the project plans under the Project Planning Phase of this work assignment.

This project plan will address facets of technical, site, and project information management including:

- Data collection
- Data security
- Field sample logging
- Sample management and tracking
- Document control and inventory
- Technical data analysis and reporting

Table 5-1

Elements of the QAPP

Title Page and Approval Page
Project Description
Project Organization and Responsibilities
QA Objectives for Measurement
Sampling Procedures
Sample Custody
Calibration Procedures
Analytical Procedures
Data Reduction, Validation and Reporting
Internal Quality Control
Performance and Systems Audit
Preventative Maintenance
Data Assessment Procedures
Corrective Actions
Quality Assurance Reports

- Compliance with data quality objectives
- Others

As part of this management plan, the tasks and milestones for the project will be established and based on an approved RI/FS Work Plan and other known requirements of the project. Field completion deadlines and report deliverable deadlines will be established as part of this plan.

Data for this RI/FS will be managed to ensure the accurate, secure, and complete control of site data.

5.1.17 Project Management

A project management plan will be developed to track the progress of the RI/FS for the participating parties. The goal of this management plan is to assure completion of the project tasks in agreement with the completion schedule and in a cost-effective manner.

5.1.18 Task Management and Quality Assurance

During the Project Planning task, the Site Manager and RI/FS Leader will be responsible for technical tracking of the investigation.

Monthly written progress reports will be submitted by the participating parties to the USEPA and NYSDEC to allow the agencies to evaluate the past and projected progress of the RI/FS, as suggested in USEPA guidance documents. The report will describe the actions and decisions taken during the previous month and activities scheduled during the upcoming reporting period. In addition, available validated analytical data generated during the month will be appended to the report. A statement regarding the manner and extent to which the procedures and dates established for the RI/FS are being met will also be included.

5.2 Task 2 - Community Relations

Many of the Community Relations activities to be conducted at the Tri-Cities Barrel site will be the primary responsibility of the USEPA. In conducting the tasks indicated below, it is recognized that the USEPA will want to produce the work products (e.g., Community Relations Plan, Fact Sheets, etc.) for distribution to the general public. With respect to Community Relations aspects of the RI/FS, the participating parties role will be one of review and support, and to provide assistance in each of the areas indicated as needed and requested.

5.2.1 Community Interviews

Before a community relations plan can be developed, community interviews must be conducted to identify issues of concern to the community and effective mechanisms for establishing the desired two-way communication with the community. The following activities will be needed to accomplish this task:

- Identification of interested groups or individuals will be primarily accomplished by the USEPA in consultation with the participating parties. The participating parties will assist in that effort as needed.
- Establishing the level of effort required will be a task for the USEPA to determine.
- Review of available information about the site (e.g., news clippings and preliminary site reports) to look for issues that are likely to arise in interviews.
- Meet with the Remedial Project Manager (RPM), USEPA community relations staff, and other project staff as appropriate to identify issues and obtain background material.

5.2.2 Community Relations Plan

Assistance will be offered to the USEPA Community Relations personnel as needed in the development of the Community Relations Plan (CRP).

5.2.3 Fact Sheets

Fact sheets are required at certain points in the community relations process:

- To help inform the community of the availability of the information repository (this fact sheet is not required by the National Contingency Plan, but it is recommended as a way to begin the process of communication)
- On completion of the final engineering design

Assistance will be offered to the USEPA as necessary in preparing Fact Sheets for distribution, and will be reviewed for accuracy and content prior to distribution.

5.2.4 Public Meeting Support

Public informational meetings may be appropriate:

- During RI/FS scoping.
- To receive public comment on the proposed remediation plan.
- To brief the public before initiation of the remedial action.
- As needed.

Assistance will be offered to the USEPA as necessary to support preparation for public meetings.

5.2.5 Technical Support for Community Relations

Meetings to discuss technical aspects of any Community Relations activity will be offered as necessary.

5.2.6 Community Relations Implementation

Although primarily a responsibility of the USEPA Community Relations staff, assistance in the implementation process will be offered as needed.

5.2.7 Task Management and Quality Assurance

Monthly progress reports will be submitted following the guidelines of OSWER Directive 9355.3-01.

5.3 Task 3 - Field Investigations

RI field investigation activities are proposed in a phased approach. Sections 5.3.1 through 5.3.6 discuss Phase I of the RI in detail. Activities that may be indicated for subsequent RI phases are discussed in Section 5.3.7.

5.3.1 Mobilization and Demobilization

The mobilization subtask includes the planning and initial phases of work to support the field investigation. Phase I RI mobilization activities will include the following:

- Continue background data and existing literature searches and evaluations
- Obtain access to site
- Sample existing site wells
- Conduct cultural resources study

- Obtain necessary permits
- Clear site utilities
- Construct site facilities
- Move drums, if necessary
- Mobilize equipment
- Orient field personnel and perform site reconnaissance
- Air sampling
- Demobilize and restore site

5.3.1.1 Site Access. An agreement of cessation of operations and cooperation was entered on March 18, 1992, between the Tri-Cities Barrel Superfund Site PRP Group and Mr. Gary Warner, the owner and operator of the Tri-Cities Barrel Corporation. This agreement provides the PRP Group the access needed to investigate the site. The only site access agreement that may be necessary during the RI is for the neighboring properties in order to collect the proposed surface water, sediment, and surficial soil samples.

The Phase I activities north of I-88 will consist of site reconnaissance, soil sampling, and surface water and sediment sampling. Because this property is owned by Tri-Cities Barrel, Inc., a separate site access agreement to conduct field activities will not be needed. Coordination to enter the property from I-88 will be made by the participating parties with the NYSDOT. Because of the nature of the activities proposed, it will not be necessary to install a gate in the fencing of I-88. However, installation of a gate in the fencing of I-88 may be necessary in order to conduct Phase II activities.

5.3.1.2 Groundwater Users Inventory. Based on the May 1990 New York State Department of Health survey results (7 wells sampled with results below detection) and the limited information about source areas and contaminant migration, this task is not needed as part of the Phase I activities. Reevaluation of the need for conducting this task will be made based on results obtained from the Phase I investigation.

5.3.1.3 Sample Existing Site Monitor Wells. The purpose of this activity is to concurrently sample the four existing site wells to quickly assess current groundwater contamination conditions. Site wells were last sampled 5 years ago. This subtask should be completed as early as possible in the RI/FS investigation.

The four existing onsite wells will be sampled for TCL and TAL parameters.

5.3.1.4 Cultural Resources. The cultural resources study that was conducted before I-88 was constructed will be reviewed to determine if the Tri-Cities Barrel site has historical significance. In addition, a Stage 1A Cultural Resource Study will be performed as part of the Phase I investigation and before conducting any excavation activities. This survey is necessary to insure compliance with Section 106 of the National Historic Preservation Act and includes conducting records and cartographic research and a site reconnaissance.

5.3.1.5 Clear Site Utilities. Before any intrusive activities, such as trenching or excavating, buried utilities on the site will be identified and "cleared." These utilities would include buried electrical lines, sewer and water lines, gas transmission lines, and telephone cables which enter the site from the public right of way. Clearances will be the responsibility of the subcontractor, who will provide written documentation of clearances prior to any subsurface activity is conducted.

5.3.1.6 Construct Site Facilities. Sanitary facilities will be installed, including a portable toilet. Because the onsite activities will be only 3 to 4 weeks in duration for the Phase I activities, it will not be necessary to construct the extensive site facilities described in the WESTON Work Plan. Temporary support facilities will include construction of a temporary decontamination area for decontamination of equipment during the Phase I investigation, portable sanitary facilities, and temporary offices and storage areas will be established, as necessary.

5.3.1.7 Survey 100-Foot Grid Over Entire Site. Because the geophysical survey is eliminated from the Phase I investigation, the 100-foot grid is not needed. Precise coordinates of the Phase I trenches and soil sampling locations will be determined by a surveying subcontractor.

5.3.1.8 Site Preparation. It may be necessary to relocate or remove drums, trailers, and ferrous debris in order to conduct the proposed phase I activities. It is anticipated that this activity can be completed before initiating the Phase I field investigation. A backhoe, forklift, or tractor with an operator may be required to provide these services onsite.

5.3.1.9 Mobilize Equipment and Supplies. This subtask will include all activities required to procure equipment and supplies and mobilize these items to the site for Phase I of the RI.

5.3.1.10 Orient Field Personnel and Perform Site Reconnaissance. This activity will consist of an onsite project briefing for each field team member in order to review health and safety requirements, quality assurance protocols, and field procedures. Subcontractors involved in field activities will also participate in an onsite briefing prior to commencing field work. Personnel from Tri-Cities Barrel will also be briefed on the health and safety requirements, as appropriate.

Routine health and safety and field progress briefings will be held for the project team and subcontractor personnel conducted by the onsite safety coordinator.

Before initiating Phase I field activities, field personnel will perform a reconnaissance of the site. A PID (e.g., HNU Systems, Inc.) or an organic vapor analyzer (OVA) will be used during the site walkover to assess hazards and background concentrations of organic vapors in the breathing zone. During the reconnaissance, the following will be observed or identified:

- Presence of absence of wetlands at the site
- Evidence of buried drums
- Staining of surface soils
- Storage location of drums and other potential sources of contaminants
- Potential physical hazards
- Potential source areas
- Building interior characteristics, including the sump
- Septic tank
- Drainage ditches and Osborne Creek
- Evidence of dredging of Osborne Creek near the site.
- Current site activities

5.3.1.11 Building Investigation. A building investigation will be performed during the Phase I investigation to assess the presence of contamination from the incinerator and exterior wall of the process building closest to the incinerator and in the process building, particularly on the floor, wall, and ceiling surfaces, for the purpose of evaluating the threat of a release of contaminants to the environment.

An initial walk through survey will be conducted to gain a clear understanding of past operational practices and to confirm areas of potential contamination for collection of screening samples. If available, schematics of the building will be obtained. If these are not available, drawings will be made based on field notes and sketches.

Based on observations from previous site visits, the major areas of potential contamination within the process building include the floor near the washer tanks, the 2 5,000-gallon open top tanks and clow unit, the rectangular chaining tank, the steel shot blaster unit, and the spray paint booth. The floor, ceiling, and walls in the room containing the smoke washer unit are also areas of potential contamination as are the rafters and ceiling above the steel shot blaster unit and spray paint booth.

Once areas of potential contamination have been confirmed during the walk through survey, samples will be collected to establish whether or not contamination is present. Samples will be obtained from hard surfaces such as floors, walls, and ceilings or rafters. If possible, the material (i.e., dust, dirt) will be removed from the surface by scraping and placing it in a sample container. If the material can not be easily removed from the surface, a concrete core sample will be collected and submitted for analyses. Surface areas of personnel contact or those areas associated with air handling systems are highly desirable locations to sample.

During the Phase I investigation, a preliminary sampling investigation will be conducted. A total of 13 samples will be collected as summarized in Table 5-2. Two samples (BS-1 and BS-2) will be collected from the floor near the washer tanks. One sample (BS-3, BS-4, BS-5, and BS-6) will be collected from the floor near each of the following areas: two 5,000-gallon open top tanks and clow unit, rectangular chaining tank, steel shot blaster unit, and spray paint booth. One sample (BS-7) will be collected from the floor, one sample (BS-8) will be collected from the wall, and one sample (BS-9) will be collected from the ceiling in the room containing the smoke washer unit. Two samples (BS-10 and BS-11) will be collected from either the rafters or ceiling above the steel shot blaster unit and above the

Table 5-2

Proposed Sampling Locations inside Process Building
Tri-Cities Barrel Site
Fenton, New York

Sample	Location	Rational
BS-1	Floor near washer tank	Determine if contamination is present
BS-2	Floor near washer tank	Determine if contamination is present
BS-3	Floor near 5,000-gallon open top tanks and clow unit	Determine if contamination is present
BS-4	Floor near chain tank	Determine if contamination is present
BS-5	Floor near steel shot blaster unit	Determine if contamination is present
BS-6	Floor near spray paint booth	Determine if contamination is present
BS-7	Floor in smoke washer room	Determine if contamination is present
BS-8	Wall in smoke washer room	Determine if contamination is present
BS-9	Ceiling in smoke washer room	Determine if contamination is present
BS-10	Rafter or ceiling above steel shot blaster unit	Determine if contamination is present
BS-11	Rafter or ceiling above spray paint booth.	Determine if contamination is present
BS-12	Outside surface of incinerator	Determine if contamination is present
BS-13	Exterior wall of process building closest to incinerator	Determine if contamination is present

spray paint booth. One sample (BS-12) will be collected from the outside surface of the incinerator, and one sample (BS-13) will be collected from the exterior wall of the process building which is closest to the incinerator. These 13 sample locations target the areas that have been identified as potential source areas which could cause a release of contaminants to the environment. Eleven of the 13 locations are distributed throughout the interior of the process building and thus, will provide results for the entire building.

The 13 samples will be analyzed for VOCs and TAL metals. The procedures for collection will be specified in the SAP and the QA/QC protocols will be specified in the QAPP.

5.3.1.12 Air Sampling. Air quality monitoring will be conducted during the Phase I investigation and used in a preliminary assessment of air emissions for risk assessment. A more detailed description of air sampling is provided in Section 5.3.3.1.2. To date, limited data have been collected and the associated risk has been assumed to be zero.

Based on the low levels of volatile organics found in soil samples (PCE (76 ug/kg), 1,1,-DCA (6.3 ug/kg), trans-1,2-DCE (20 ug/kg), 1,1,1-TCA (17 ug/kg), and TCE (14 ug/kg)), it appears that volatile organic air emissions emanating from the soil will be minimal.

It is possible, however, that there are pockets of higher concentrations of volatiles that might be released to the air during excavation. As a precaution, air monitoring for volatile organics will be conducted during the excavation activities to ensure that releases do not pose a threat to the onsite workers and the general public. As a further precaution, the trench will be backfilled with excavated soil as work progresses. All exploration trenches will be covered at the end of each working day.

Ambient air monitoring will be conducted with a PID before and continuously during trenching activities. Personnel air monitoring will be performed on all personnel entering the exclusion zone (EZ) during trenching activities. Air samples will be collected with personal air pumps and charcoal filters. ESC will follow personnel air sampling procedures as outlined in "Methods of Air Sampling and Analysis, Third Edition, by James P. Lodge, Jr., 1989". Perimeter air monitoring will also be conducted using three high volume air sampling stations as outlined below to document the absence of a release of VOCs from the site. Additionally, a wind sock will be placed on the site and the wind direction will be monitored closely and recorded at least hourly during trenching activities. Wind velocity data will also be collected during trenching activities.

5.3.1.13 Demobilize and Restore Site. Equipment will be demobilized at the completion of each phase of field activities, as necessary. This may include, but not be limited to, sampling equipment, subcontractor equipment, personnel and equipment decontamination equipment and sanitary facilities. Trenches will be backfilled and regraded before Phase I demobilization. Additionally, areas of surface soil disturbed by field investigation activities will be reseeded or covered with gravel before Phase I demobilization.

5.3.2 Physical Characteristics

5.3.2.1 Human Population and Land Use. Demographic and land use data will be collected as part of the Phase I investigation.

5.3.2.2 Conduct Aerial Survey and Develop Topographic Base Site Map. This activity will be completed prior to completion of Phase I of the field investigation so that sampling and piezometer locations may be mapped accurately. A surveying subcontractor will be procured to provide ground truth for the site map.

A detailed topographic map of the site will be developed from aerial photography and will be field checked to reflect the current conditions of the site. The site map will be prepared with 2-foot contours and will include roads; rights-of-way; buildings; other manmade features; property lines or deed boundaries; and the extent of woods, fences, streams, and water bodies. The site information will be tied into existing USGS and New York State benchmarks or datum points so that both horizontal and vertical references are easily and accurately reproduced. All vertical data, contours, and elevations will be tied to USGS datum and will be presented in feet above mean sea level. The 100-foot grid will not be included because the geophysical survey has been eliminated from the Phase I investigation. Onsite monuments, established during the survey, will be used to expedite the location of site and characterization features.

The site map will extend at least 100 feet beyond the site boundaries and will be presented at scales necessary for complete and accurate characterization. The scale utilized will be 1 inch = 50 feet, which will meet National Map Accuracy Standards.

For those areas outside the immediate site area, all mapping will be based on available sources from the USGS and NYSDOT. The basic sources, because of their accuracy and completeness, will be maps available from NYSDOT and USGS as part of the 7.5-minute series, 1:24,000 (1 inch = 2,000 feet) topographic quadrangles. However, because of the size of these maps, only those areas within a 5-mile radius of the site will be included. Maps included in the body of the RI/FS report will be reduced in scale as necessary.

5.3.2.3 Ecological Investigation. As part of the Phase I investigation, literature reviews will be conducted to determine the location of the nearest wetlands to the site and the locations of the 100- and 500-year floodplains. During the site reconnaissance, ESC will confirm the absence of wetlands at the site. In addition, as part of the Phase I investigation, ESC will perform a three parameter wetland delineation to identify, delineate, and flag borders of wetlands that exist at the Tri-Cities Barrel site. The wetland delineation will follow the multi-parameter approach detailed in the Federal Manual for Delineating Jurisdictional Wetlands (1989).

Additionally, Step I - Site Description and Step II - Contaminant Specific Impact Analysis of a fish and wildlife assessment will be conducted according to the guidelines of the NYSDEC Draft Fish and Wildlife Impact Analysis for Inactive Hazardous Waste Sites (1991). Existing information and data will be used to the fullest extent possible and will be supplemented with literative reviews. If the third part of Step II, Analysis of Toxicological Effects, is necessary, it may not be completed until the Phase II RI data are received.

5.3.3 Hydrogeochemical Investigation

Contaminant distribution is a function of:

- Historic waste handling/processing and disposal practices
- The physio-chemical properties of the contaminants (solubility, specific gravity)
- The sorptive/retarding capabilities of the aquifer solids (as a function of organic content)
- The movement of groundwater in the vadose and saturated zones
- Meteorological conditions

Characterization of contaminant sources will be accomplished in Phase I through a series of activities including:

- Surface soil sampling
- Monitor well sampling
- Surface water and sediment sampling
- Trenching and subsurface soil sampling
- Piezometer installation and deep soil sampling

A phased approach is proposed to allow project planning and scoping of later activities based on a set of site-specific assumptions developed from the results of earlier phases. Data collected, reduced, and analyzed from previous phases will provide the basis for subsequent activities.

Phase I is currently envisioned to:

- Evaluate the possible location and nature of contamination sources through a detailed historical and site operations review.
- Identify the types and conditions of soils and sediments related to likely source areas at the site.
- Study the presence and distribution of contaminants in the overburden soils particularly with respect to the historic trends of waste handling activities.
- Evaluate the process building to assess the presence of contamination in the process building and the potential of a release of contaminants to the environment.
- Evaluate the hydrogeologic conditions with respect to the direction of groundwater flow in the shallow water-bearing zone.

- Evaluate the need and scope of site investigation activities that may be completed in subsequent Phases of the RI.
- Evaluate potential migration pathways. Critical data gaps that may be identified as a result of evaluation of Phase I data will be filled in by Phase II activities.

Surface and subsurface sampling will be conducted in areas known or interpreted (through aerial photographs and site reconnaissance) to have been associated with waste storage, waste handling, or process lagoons. To complete this work, a series of exploration trenches will be dug in those areas suspected of being the principal source areas of contamination. This approach will allow for an extensive evaluation of the source areas. The collection of soil samples from the trenches to characterize contaminant levels and distribution will be more efficient than collecting samples from boring locations based on a grid system. A hydrogeologist will log soils from the trenches at the time of excavation to evaluate the subsurface conditions.

In the overburden, piezometers will be screened across the water table to measure water levels and evaluate the hydrogeologic conditions in the shallow water-bearing zone (WBZ), in particular, to determine the direction of groundwater flow. The water level of Osborne Creek will also be determined using a permanently installed and surveyed staff gauge. The WBZ in the overburden is reportedly in direct communication with the shallow, fractured bedrock water-bearing zones, resulting in a single aquifer.

The locations of the trenches and piezometers may be modified based on the site reconnaissance results.

5.3.3.1 <u>Conduct Geophysical Survey</u>. The geophysical investigation proposed in the WESTON Work Plan consisted of a magnetometer survey followed by a ground penetrating radar survey (GPR) or an electrical terrain conductivity survey if the GPR survey was not effective. The previous geophysical survey conducted by ES/D&M consisted of a magnetometer survey and an electrical resistivity survey to obtain detailed subsurface information which addressed the principal areas of investigation proposed in the WESTON Work Plan.

It should also be noted that an additional seismic refraction survey was proposed in the WESTON Work Plan to delineate bedrock topography if needed. An estimate of the depth-to-bedrock was previously provided by ES/D&M as a result of the electrical resistivity survey.

Recent aerial photographs will be reviewed to determine if any significant changes (i.e., disposal of drums onsite) have occurred since 1985 when the geophysical survey was conducted by ES/D&M. A review of the existing geophysical data will also be completed before selecting the final locations of the trenches which will be installed as part of the Phase I investigation. Additionally, before hand augering or trenching, a survey of the area will be conducted using a portable metal detector. Based on the results of the Phase I investigation, geophysical testing may be conducted during the Phase II investigation. Factors which may warrant a Phase II geophysical survey include:

- Recent disposal of drums based on aerial photograph analysis.
- Data gaps that may be identified as a result of the Phase I investigation and which cannot be addressed by previous geophysical survey, trenching, and review of historical aerial photographs.

5.3.3.1.1 <u>Surface Soil Sampling</u>. A total of 24 surface soils will be collected at 12 locations as summarized in Table 5-3. The purpose of collecting soil samples (SS-1 to SS-6 and SS-10, and SS-11)

Table 5-3

Proposed Surface Soil Sampling Locations
Tri-Cities Barrel Site in Fenton, New York

Sample	Location	Rationale
Surface Soils		
SS-1	1958 discharge pattern south of Interstate 88	Determine if discharge pattern caused by release of contaminants
SS-2	1958 discharge pattern north of Interstate 88	Determine if discharge pattern caused by release of contaminants
SS-3	1958 discharge pattern north of Interstate 88	Determine if discharge pattern caused by release of contaminants
SS-4	Southern side of incinerator	Determine if operation of incinerator has contaminated soils
SS-5	Northern side of incinerator	Determine if operation of incinerator has contaminated soils
SS-6	Open area between process buildings	Determine contaminants in area of stained soils
SS-7	North of Old Route 7	Upgradient sample
SS-8	Southwest of Tri-Cities Barrel site	Background sample
SS-9	Southwest of Tri-Cities Barrel site	Background sample
SS-10	Discharge pattern north of Interstate 88	Determine if discharge pattern caused by release of contaminants
SS-11	Discharge pattern near Osborne Creek	Determine if discharge pattern caused by release of contaminants
SS-12	South of Osborne Hollow Road	Determine if storage of drums in this area has contaminated soils

a\ At each sample location, samples will be collected at a depth of 0 to 6 inches and 30 to 36 inches.

is to identify further the environmental significance of the drainage pattern observed in the 1958 aerial photograph and investigate areas of surface staining that were observed during the site visit. These samples, will be collected in areas with stained or disturbed soils or stressed vegetation. The location of the background sample SS-7 and SS-12 will be selected based on the review of background information for the site, analysis of aerial photographs, and the observations of the site reconnaissance. SS-12 will be located south of Osborne Hollow Road in the vicinity where drums were formerly stored to determine if the soils have been affected. Background soil samples (SS-8 and SS-9) will be located southwest of the facility (upwind of the incinerator) and on property not owned or previously owned by Tri-Cities Barrel. The proposed locations of these two sampling points Table 5-3 are contingent on approval by the property owner to access the property. Tentative sample locations are shown on Figure 5-1.

For each location, two soil samples will be collected using a hand auger. The first sample will be collected from depths between 0 and 6 inches and the second between 30 and 36 inches. Collection of samples at two depths will assist in evaluating the potential for vertical migration of contaminants into the subsurface. All of the samples will be analyzed for TCL and TAL parameters.

SS-1 will be located south of I-88 and SS-2, SS-3, and SS-10 will be located north of I-88 and within the 1958 drainage pattern. SS-11 will be located east-northeast of the northern end of the drainage pattern (near Osborne Creek) in an area where drainage may have pooled, based on review of the 1958 aerial photograph. Because the location of the drainage pattern identified in the 1958 aerial photograph may not be apparent in 1992, the 1958 aerial photograph will be used to assist with selecting the locations of SS-1, SS-2, SS-3, SS-10, and SS-11 in the field. The elevation of the land surface north of I-88 will also be evaluated to determine if this area was filled during the construction of I-88. If the area does not appear to have been buried or disturbed, up to five shallow soil borings will be advanced in the vicinity

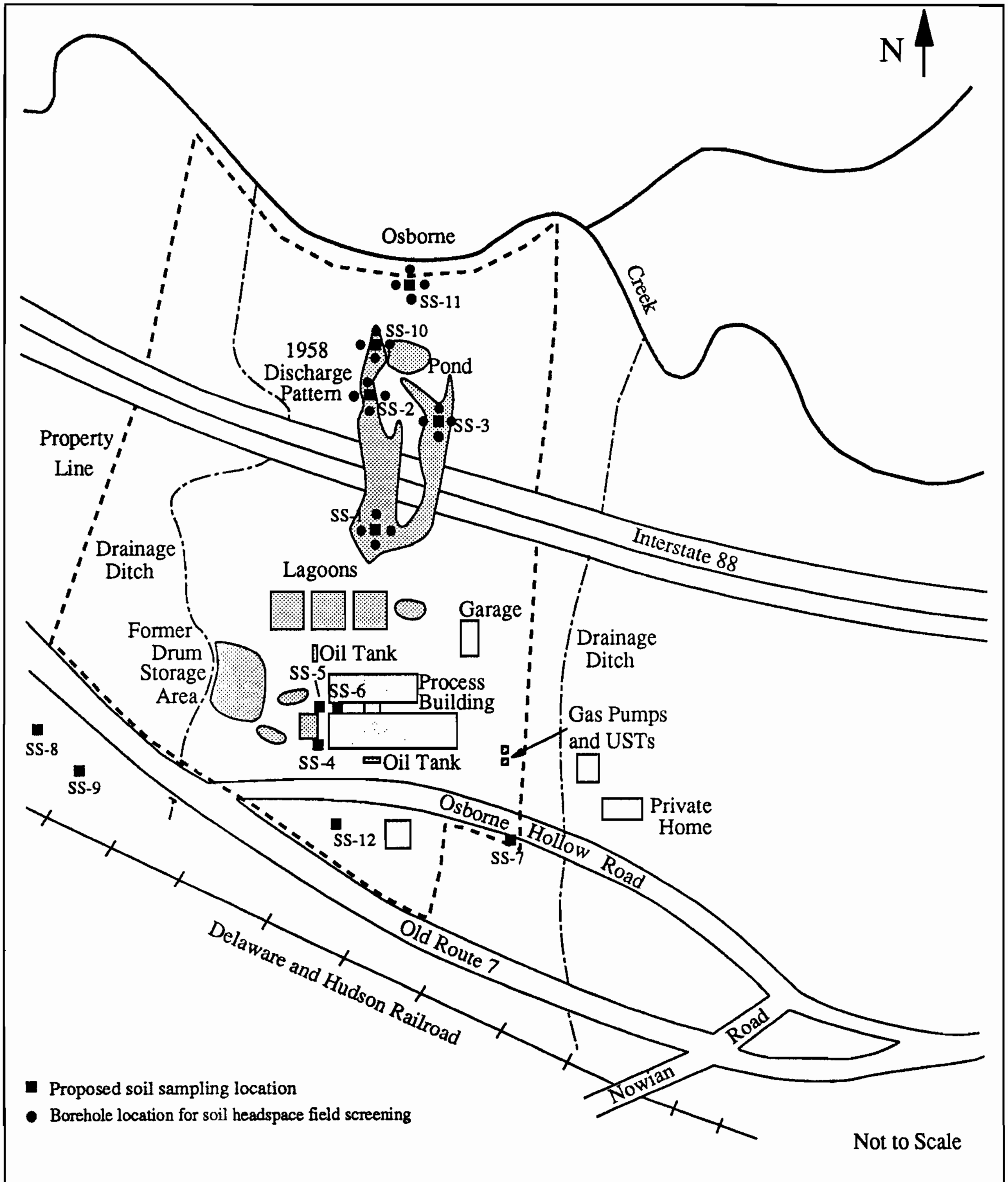

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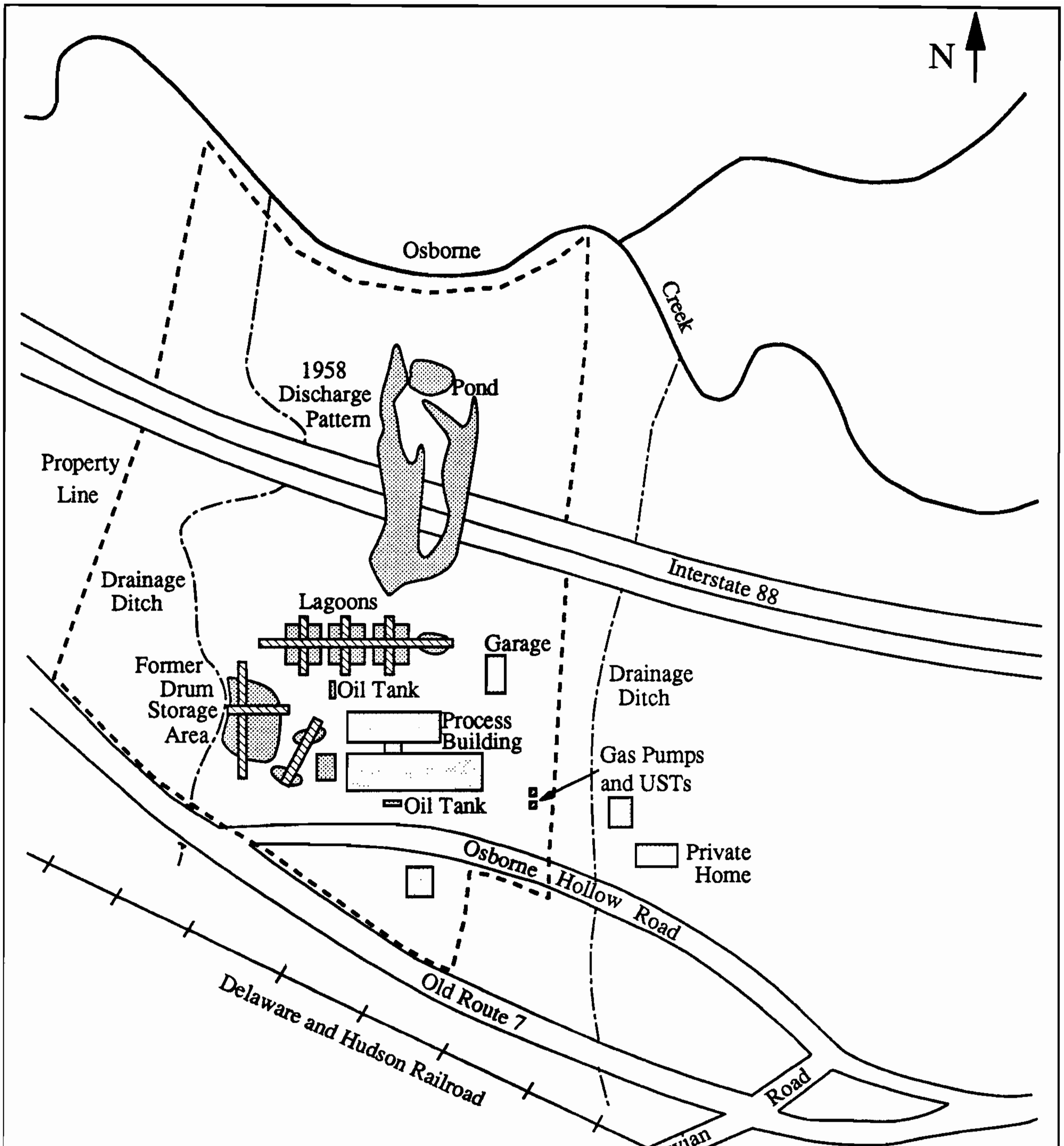
Figure 5-1

Proposed Surface Soil Sampling Locations
Tri-Cities Barrel Site
Fenton, New York

of each sampling location (SS-1, SS-2, SS-3, SS-10, and SS-11) using a hand auger. During advancement of the shallow boreholes, the soils will be inspected and the stratigraphy described to verify that the soils from the 1958 surface are intersected by the boreholes. From each borehole, a soil sample will be collected for field headspace analysis and visual observations. The results of the field headspace analyses and visual observations will be used as the basis for submitting samples from SS-1, SS-2, SS-3, SS-10, and SS-11 for laboratory analysis. Even if no VOCs are detected from the headspace analysis and no visible signs of contamination or staining are observed, 2 soil samples (from 0 to 6 inches and 30 to 36 inches) from each of the five locations will still be submitted for laboratory analyses. This sampling Figure 5-1 approach, in conjunction with interpretation of the 1958 aerial photograph, evaluation of the land surface elevation, and a detailed evaluation of the stratigraphy of the surficial soils will ensure that the soils from the 1958 surface and former drainage pattern are sampled.

5.3.3.1.2 Exploratory Trenching/Chemical Samples. Figure 5-2 shows the location of the trenches to be installed as part of the Phase I investigation. These trenches will examine the three areas that, based on existing data, are the most likely source areas where contamination entered the subsurface. The first area is the old lagoons that were located north of the process building. The second is immediately west of the process building at locations identified in the WESTON Work Plan as possible lagoons, and the third is further west of the process building in the former drum storage area. The trenches will be as narrow as possible and total about 850 feet in length.

In the area of the old lagoons north of the building, approximately 500 feet of exploratory trench will be dug to identify both the width and length of the lagoons. In the former drum storage area, two trenches for a total length of approximately 250 linear feet will be excavated to define the lateral extent of this potential source area. A single trench of approximately 100 linear feet immediately west of the



Note: Approximately 30 soil samples will be collected from the exploration trenches

Not to Scale

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Figure 5-2
Proposed Exploration Trench Locations
Tri-Cities Barrel Site
Fenton, New York

process building will be excavated to intercept both areas which were previously identified as possible lagoons.

Each trench will be excavated in stages to a maximum depth of 12 feet. However, if based on field observations, it is determined that the bottom of the lagoon has not been encountered, the depth of the trench will be extended. If the bottom of the lagoons cannot be attained using a backhoe with an extended reach, a soil boring program will be implemented in those areas as a contingency. Because the bottoms of the lagoons are not expected to exceed a depth of 15 feet and if they would, it is expected only to be a localized occurrence, the need for the advancement of soil borings will be determined in the field. As a guideline, a soil boring will be advanced in line with the trenches and in those areas where greater than 25 feet of a trench cannot be completed.

In the event that the lagoons exceed the reach of the backhoe throughout much of the area or air emissions become a concern, a comprehensive soil boring program will be implemented rather than the proposed trenching program. The soil borings will be advanced at up to 11 locations as shown on Figure 5-3. Continuous split-spoon samples will be collected and the lithology of the samples described on a boring log form. Additionally, from each split-spoon sample, a soil sample will be collected for headspace analysis and possible laboratory analyses. Based on the results of the headspace analysis and field observations, three soil samples from each boring will be submitted to the laboratory and analyzed for TCL and TAL parameters.

The trenches will be visually examined, and photoionization headspace analysis will be conducted for selected samples collected for visual examination along the trench length. Samples will be examined visually at a depth of 2 feet, 5 feet, and at the maximum excavation depth every 10 feet along the trench and more often if necessary.

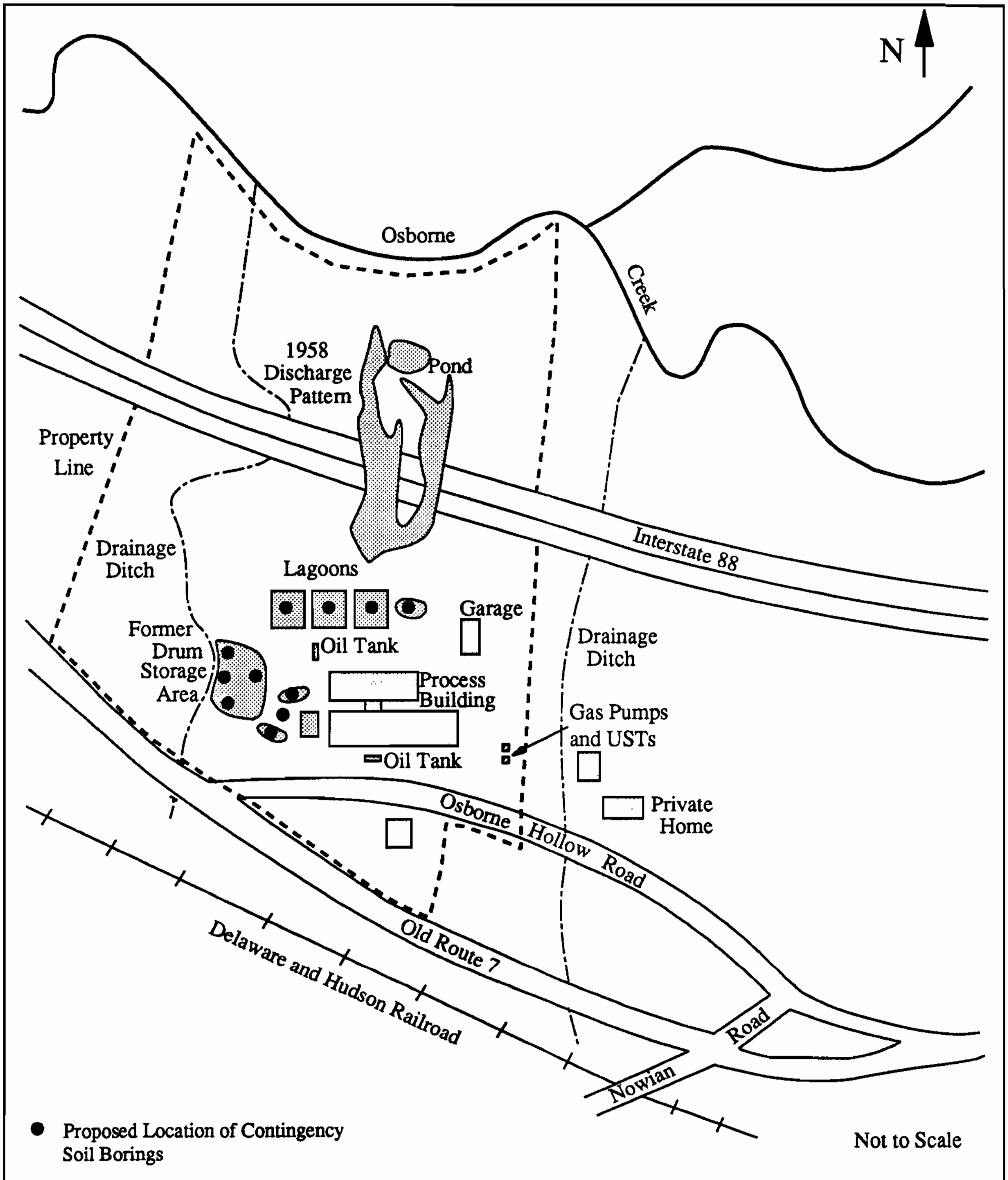

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Figure 5-3
Proposed Contingency Soil Boring Locations, Tri-Cities Barrel Site, Fenton, New York

This will result in approximately 250 samples for visual inspection. Actual intervals for sample collection will be determined based on conditions encountered in the field. A field log of the PID readings, soil characteristics, and foreign debris encountered will be kept for each trench.

Based on PID screening and visual observation, a soil sampling program will be implemented at that location. A soil sample will be collected either from the bucket of the backhoe or with hand augers, at the bottom depth of the excavation where high PID readings or visible signs of contamination are evident. Depending on the distribution of contamination, additional samples may be taken from the bottom of the excavation as the trench is deepened. Each sample will be collected in two bottles and will be visually inspected. One of the bottles will be screened by photoionization headspace analysis. If the headspace analysis indicates that high VOCs are present, the other bottle will be saved for possible laboratory analysis.

In no case will clay lenses be excavated or will soil samples be taken from them. If clay lenses are encountered below the location of the old lagoons, samples will be acquired at the interface. Samples will be logged and inspected by an onsite geologist.

If PID readings and visual inspection fail to indicate contamination, samples of the 8-to 10-foot depth (or the depth of the old lagoons based on visual examination) spaced at selected locations will be collected for possible chemical analysis. These samples will be collected with hand augers or from the backhoe bucket below the bottom depth of the excavation. As with the other sampling procedures, two sample bottles will be filled, one for headspace analysis and one for possible chemical analysis. It is anticipated that a total of approximately 30 samples will be submitted to the laboratory for chemical analysis. All excavated material will be backfilled into the trenches and evenly graded into adjacent soils.

Based on the results of the previous geophysical survey, it is not anticipated that buried drums will be encountered. However, if buried drums or containers are encountered, their locations will be noted and accurately recorded on a map. Buried drums and containers will not be removed from the excavation. If it becomes necessary to remove drums, containers, or piping from an excavation, it will be placed immediately in an 85-gallon overpack drum. All overpack drums will be labeled and stored in a designated location. Oversight of these activities will be provided as needed.

To control fugitive dust emissions that may be generated during excavation activities, the trenches will be as narrow as possible to minimize the volume of soil that is disturbed and the soil will be placed on the ground rather than allowed to free fall out of the backhoe bucket. Trenches will be backfilled with the excavated soils as work progresses and those areas disturbed by trenching will be reseeded or covered with gravel before Phase I demobilization. If during excavation activities fugitive dust emissions are generated, the area will be wetted with water or other agent to suppress and control the emissions. The site Health and Safety Coordinator will determine if it is necessary to implement fugitive dust emission controls.

The area will be monitored according to the Health and Safety Plan which will be developed for the site. Standard safety procedures will be followed during the trenching operation. At no time will the trenches be entered by personnel. Samples will be acquired using extensions to hand augers, or as grab samples from the backhoe bucket thereby enabling acquisition of samples from ground surface.

Air monitoring for VOCs will be conducted during the excavation activities to ensure that releases do not pose a threat to the onsite workers and the general public. Ambient air monitoring will be conducted with a PID before and during trenching activities. Before site activities begin each day, background VOC levels will be measured at the site, as well as at the property lines (I-88), and upwind and downwind of trenching and sampling locations. Continuous monitoring will be performed during excavation activities. In addition, a wind sock will be placed on the site and the wind direction will be monitored closely and recorded at least hourly during trenching activities. Wind velocity data will also be collected during trenching activities. During trenching activities, an oxygen/explosimeter will also be used to establish a background for oxygen levels and potential explosive vapors. Monitoring activities will be documented in logs and data recorded in notebooks as described in the Quality Assurance Project Plan (QAPP).

Personnel air monitoring will be performed on all personnel entering the exclusion zone (EZ) during trenching activities. Air samples will be collected with personal air pumps and charcoal filters. ESC will follow personnel air sampling procedures as outlined in "Methods of Air Sampling and Analysis, Third Edition, by James P. Lodge, Jr., 1989". The purpose of this monitoring is to document that these contaminants, which are present in low concentrations onsite, do not present a respirable hazard to onsite personnel. All samples will be forwarded to an approved laboratory for chemical analysis. All sampling and laboratory procedures will take place in accordance with the NIOSH procedures developed for the specific contaminants. Sampling pumps will be calibrated before use to the appropriate flow rate. Pumps will be recalibrated after use to ensure that a constant flow rate is maintained during sampling. Sampling pumps will meet Factory Mutual or UL approvals before use in explosive atmospheres. Air sampling will be performed for a minimum of 7 hours during any 8-hour work shift. Sampling results will be calculated as an 8-hour TWA and compared to the PELs published in 29 CFR 1910.1000, Subpart Z.

Perimeter air monitoring will also be conducted during trenching activities using three high volume air sampling stations located at the perimeter of the designated work areas. The location of the stations will be at the upwind and downwind portions of the work areas, as determined by the Site Health and

Safety Coordinator's analysis of daily wind direction data. The purpose of this work area monitoring will be:

- To document the levels, if any, of airborne contaminants caused by trenching activities
- To determine if any operational adjustments are necessary to reduce any emissions to an acceptable level
- To document the absence of a release of VOCs from the site

The Site Health and Safety Coordinator will perform the perimeter work area air sampling for VOCs in accordance with all applicable procedures and guidelines. These samples will be obtained daily from each of the perimeter locations. If based on field measurements, analytical results, and discussions with NYSDEC and EPA, other monitoring in addition to monitoring for VOCs is determined to be necessary, this monitoring will be conducted during trenching activities.

If a source of VOC emissions is encountered during trenching activities, a sample of the soil which is the source of the emissions will be collected after which the trench section will be backfilled to cover the source of emissions. The trenching activities will be interrupted and resume at a location at least 10 feet from the source of emissions. If emissions are again detected in the next successive trench, a soil sample will be collected and the trench would be backfilled to cover the source of emissions. Work will proceed a minimum of 10 feet from the source of each emission. This section of the trench would be targeted for investigation with a more appropriate method during subsequent phases of the investigation.

5.3.3.1.3 Installation of Piezometers. Installation of 3 piezometers is proposed to study hydrogeologic conditions at and in the vicinity of the site. As discussed earlier, groundwater in the shallow, fractured bedrock beneath the study area is reported as being interconnected (coupled) with the groundwater system in the overlying overburden materials, therefore probably forming a single aquifer. To evaluate the hydrogeology of the shallow water bearing zone, 3 piezometers will be installed. Piezometers are shown in Figure 5-4, while Table 5-4 gives a rationale for piezometer locations.

The piezometers are proposed in order to define the horizontal gradient in the shallow water-bearing zone and further evaluate the possible direction of migration of contaminants. Each piezometer is located in areas where the depth-to-groundwater is not presently known and will be spaced to provide information on the direction of groundwater flow. A review of the logs and construction features of the existing onsite monitoring wells will be completed to evaluate the use of water levels from these wells for defining the direction of groundwater flow. If acceptable, water level data from the new piezometers, existing wells, and staff gauge in Osborne Creek will be used in defining the direction of groundwater flow. If the water level data from the existing wells is not acceptable, the new piezometers and staff gauge alone will be used to define the direction of groundwater flow. Water levels in the piezometers and existing wells and from Osborne Creek will be collected on a weekly basis during the Phase I field activities and monthly thereafter through the remainder of the Phase I investigation.

During advancement of each of the soil borings for the piezometers (P-1, P-2, and P-3), continuous split-spoon samples will be collected and the stratigraphy of the samples described on a boring log form. From each split-spoon sample, a soil sample will be collected for headspace analysis and possible laboratory analyses. Based on the results of the headspace analysis and field observations, two vadose zone soil samples from each piezometer borehole will be submitted to the laboratory and analyzed for TCL and TAL parameters.

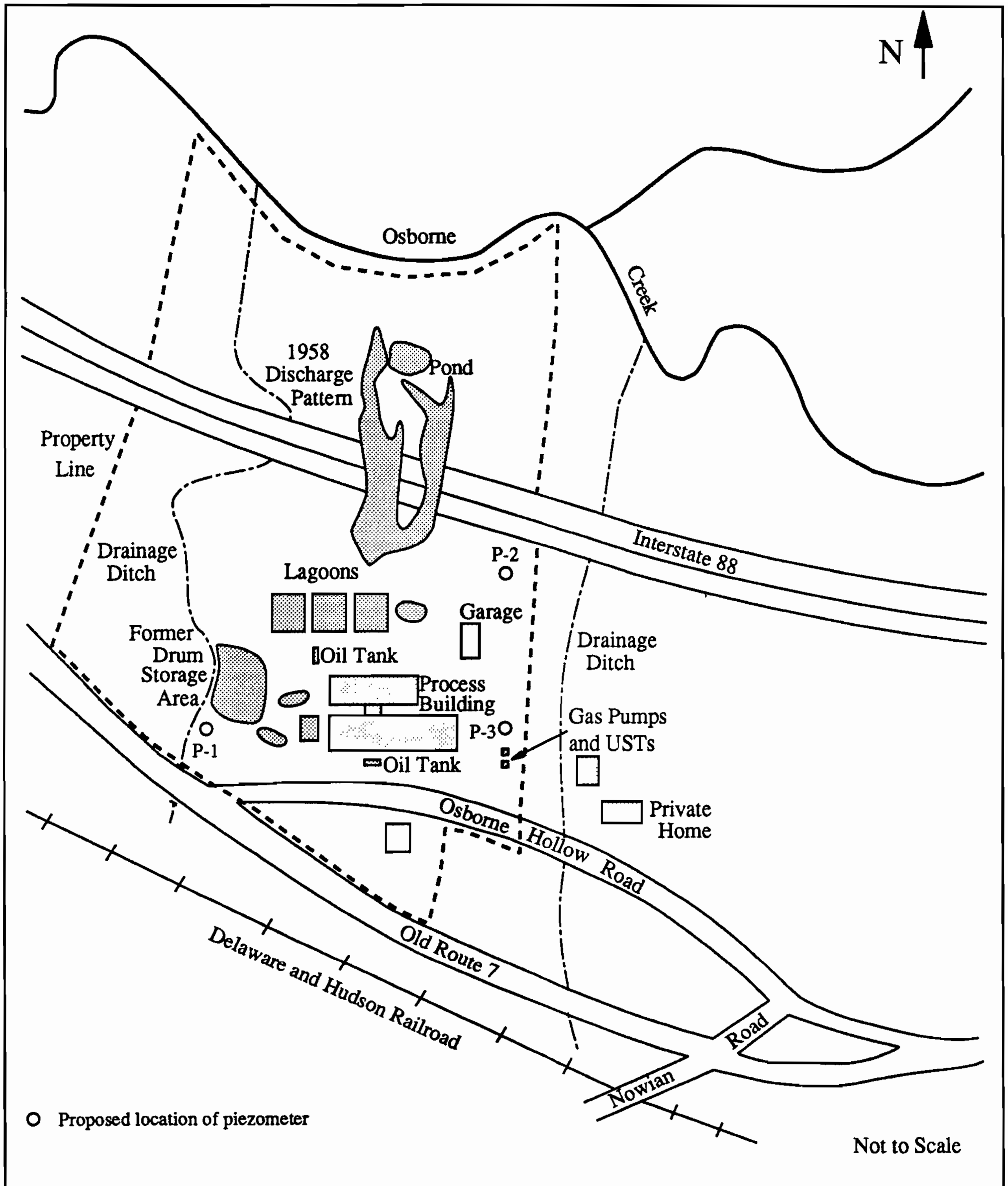

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Figure 5-4

Proposed Piezometer Locations
Tri-Cities Barrel Site
Fenton, New York

Table 5-4

Location and Rationale for Samples Collected at the Tri-Cities Barrel Site in Fenton, New York

Sample	Location	Rationale
Sediment		
SED-1	East drainage ditch at Old Route 7 intersection	Upgradient sample
SED-2	East drainage ditch at Interstate 88 intersection	Determine migration of contaminants to property north of I-88
SED-3	East drainage ditch at entrance to Osborne Creek	Determine if drainage ditch is carrying contaminants into Osborne Creek
SED-4	West drainage ditch at its origin	Upgradient sample
SED-5	West drainage ditch at Interstate 88 intersection	Determine migration of contaminants to property north of I-88
SED-6	West drainage ditch at entrance to Osborne Creek	Determine if drainage ditch is carrying contaminants into Osborne Creek
SED-7	Pond north of Interstate 88	Verify presence or absence of contaminants
SED-8	Osborne Creek, north of 1958 drainage pattern	Verify presence or absence of contaminants
SED-9	Osborne Creek, upstream of the site	Upgradient sample
SED-10	Osborne Creek, downstream of the site	Verify presence or absence of contaminants
SED-11	Sump inside process building	Verify presence or absence of contaminants
SED-12	Septic tank	Verify presence or absence of contaminants
Surface Water		
SW-1	Sump inside process building	Verify presence or absence of contaminants
SW-2	Spring south of Osborne Creek	Verify presence or absence of contaminants
SW-3	Septic tank	Verify presence or absence of contaminants
SW-4	Pond north of Interstate 88	Verify presence or absence of contaminants
SW-5	Osborne Creek, north of 1958 drainage pattern	Verify presence or absence of contaminants
SW-6	Osborne Creek, upstream of the site	Upgradient sample
SW-7	East drainage ditch at Interstate 88 intersection	Verify presence or absence of contaminants
SW-8	West drainage ditch at Interstate 88 intersection	Verify presence or absence of contaminants
SW-9	Osborne Creek, downstream of the site	Verify presence or absence of contaminants

Table 5-4
(continued)

Location and Rationale for Samples Collected at the Tri-Cities Barrel Site in Fenton, New York

Sample	Location	Rationale
Groundwater Elevation (piezometer)		
P-1	South of former drum storage area	Determine direction of groundwater flow
P-2	North of garage	Determine direction of groundwater flow
P-3	North of gas pumps	Determine direction of groundwater flow and existance of free product, if any
O-1	Osborne Creek	Determine direction of groundwater flow

Each piezometer will be constructed such that the well screen extends across the water table. It is anticipated that approximately 3 feet of screen will extend above the water table and 7 feet below the water table.

Piezometer installation and development will be in accordance with NYSDEC and USEPA guidance, as will the handling of decontamination fluids, cuttings, and development waters. All drilling and piezometer installation will be supervised by a hydrogeologist.

5.3.3.2 Aquifer Testing. Aquifer testing will not be conducted as part of the Phase I investigation. The purpose of the piezometers is to obtain water level measurements to determine the direction of groundwater flow in shallow water-bearing zone. If groundwater monitoring wells are installed as part of a Phase II investigation, aquifer slug tests will be conducted during the Phase II investigation to determine the hydraulic conductivity of the aquifer for calculating groundwater flow rates.

5.3.3.3 Groundwater Sampling. The three monitoring wells and one production well shown in Figure 5-5 will be sampled for the TCL and TAL parameters in accordance with NYSDEC and USEPA guidance. Water levels will also be collected before and after well purging and sampling activities. Concern has been expressed by the NYSDEC as to the integrity of the ES/D&M Phase II wells. This possible problem will be evaluated by evaluating the water levels in conjunction with the proposed piezometers and comparing analytical results obtained in the Phase I with previous test results. Should the test results appear anomalous in comparison to the piezometers or previous data, the wells may need to be appropriately abandoned. The current assumption is that the wells will be usable and abandonment will not be necessary.

5.3.3.4 Surface Water and Sediment Sampling. Surface water will be collected at 9 locations and sediment samples collected at 12 locations as shown on Figure 5-6. The sample locations were selected

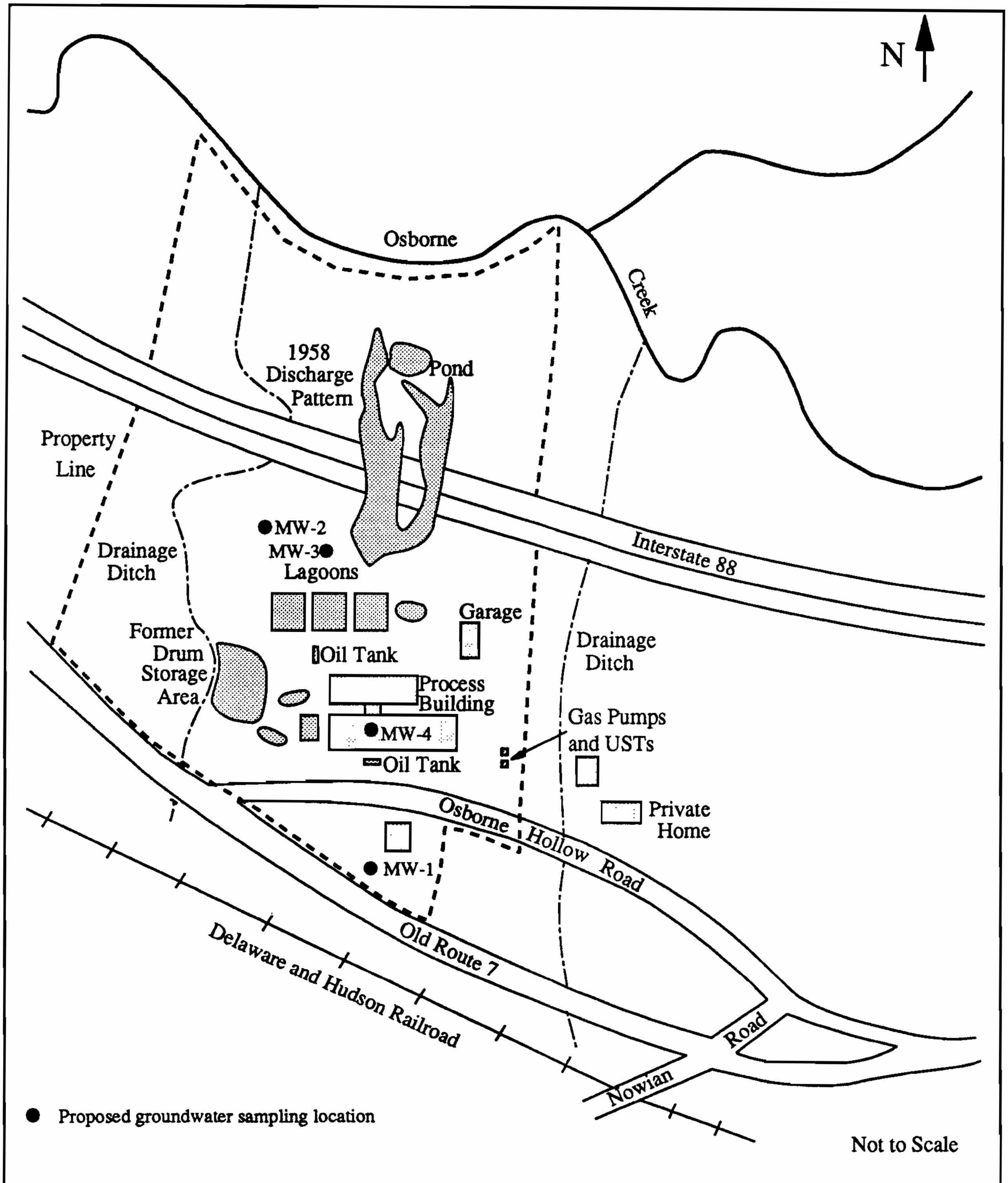

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Figure 5-5

Proposed Groundwater Sampling Locations
Tri-Cities Barrel Site
Fenton, New York

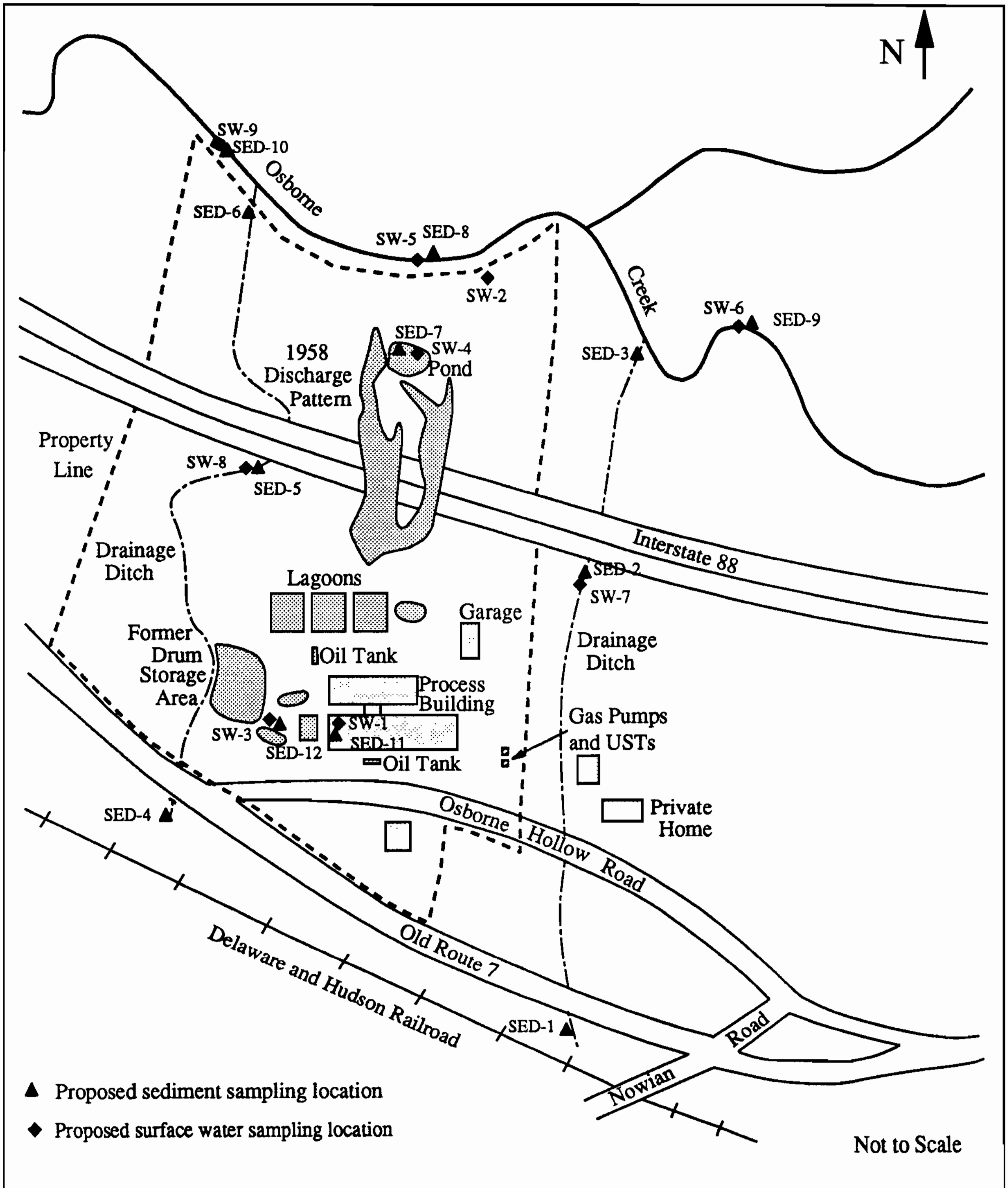

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Figure 5-6

Proposed Surface Water and Sediment Sampling Locations, Tri-Cities Barrel Site, Fenton, New York to define potential migration of contaminants from source areas, to characterize potential source areas, and to determine if Osborne Creek has been affected by site operations.

This sampling will be conducted concurrently with the groundwater sampling program to provide data from a single point in time. These locations and sampling points are shown in Figure 5-6 and described in Table 5-4.

As shown on Table 5-4, surface water from four potential source areas and from the drainage ditches and Osborne Creek will be sampled. These four potential source area locations consist of:

- The sump inside the building
- The spring south of Osborne Creek which could provide information on the quality of shallow groundwater north of I-88
- The pond north of I-88 which was previously described as a lagoon containing waste material
- The septic tank south west of the process building

The sediment samples will be collected from a depth of 0 to 1 foot and placed in a stainless steel or aluminum mixing bowl. The VOC sample container will be filled with sediment from throughout the sampling interval without mixing the sample; which would volatilize many of the VOCs. Following collection of the VOC sample, the sediment remaining in the mixing bowl will be thoroughly homogenized and the sample containers for the other analytes will be filled.

At the present time, sampling of the Chenango River is not recommended because ES/D&M sampling of Osborne Creek did not find significant levels of contaminants. If the Phase I analytical results differ significantly from the existing information, additional sediment samples will be collected. Temperature, pH, and specific conductance will be measured in the field at all surface water sampling locations. The surface water and sediment samples will be analyzed for all TCL and TAL compounds. The surface water samples will also be analyzed for hardness and the sediment samples will also be analyzed for total organic carbon.

Applicable QA/QC and sample collection procedures, as detailed in the SAP, will be followed to ensure the integrity and validity of the results.

5.3.3.5 Survey Sample Locations and Elevations. On completion of the Phase I activities, the trench locations, and trench soil, surface soil, surface water/sediment sampling locations, and piezometer and staff gauge locations and elevations will be surveyed and plotted on the base map.

5.3.4 Hydrogeologic Data Reduction and Evaluation

5.3.4.1 Geologic Conceptual Model. Lithologic logs from the exploration trenches and piezometers will be compiled. These data will be used to construct pictorial stratigraphic and hydrogeologic logs, piezometer construction diagrams, and soil profile cross sections.

5.3.4.2 Groundwater Flow Model. Field and laboratory data will be evaluated and interpreted to develop a conceptual groundwater flow model, and to evaluate the need, location, and depth for piezometers and groundwater monitoring wells in addition to those already existing onsite or being installed as part of the Phase I investigation.

5.3.5 Subcontractor Procurement

This task will include the procurement of subcontractors to perform specific tasks as outlined in this Work Plan. It will be conducted at the same time as mobilization tasks.

Subcontractors needed for Phase I of the RI include:

- An aerial photography and topographic mapping subcontractor will produce a detailed site topographic map.
- The surveying subcontractor will be responsible for ground truth for topographic map; and surveying piezometer and staff gauge locations and elevations and the location of the exploratory trenches, and the locations of surface soil, surface water, and sediment samples.
- A waste disposal subcontractor(s) (both solid and liquid drums and decon fluids), if wastes are to be disposed of separate from the activities associated with the selected remedial alternative.
- A drilling subcontractor (will also construct a temporary decontamination pad.)
- A subcontractor to move drums onsite (a backhoe operator).
- A subcontractor to excavate the exploratory trenches and regrade disturbed areas.

5.3.6 RI Waste Disposal

Waste generated during the RI is expected to consist of trash (boxes, paper, etc.), auger cuttings, decon water, purge water, and used protective clothing. Disposal will be as follows:

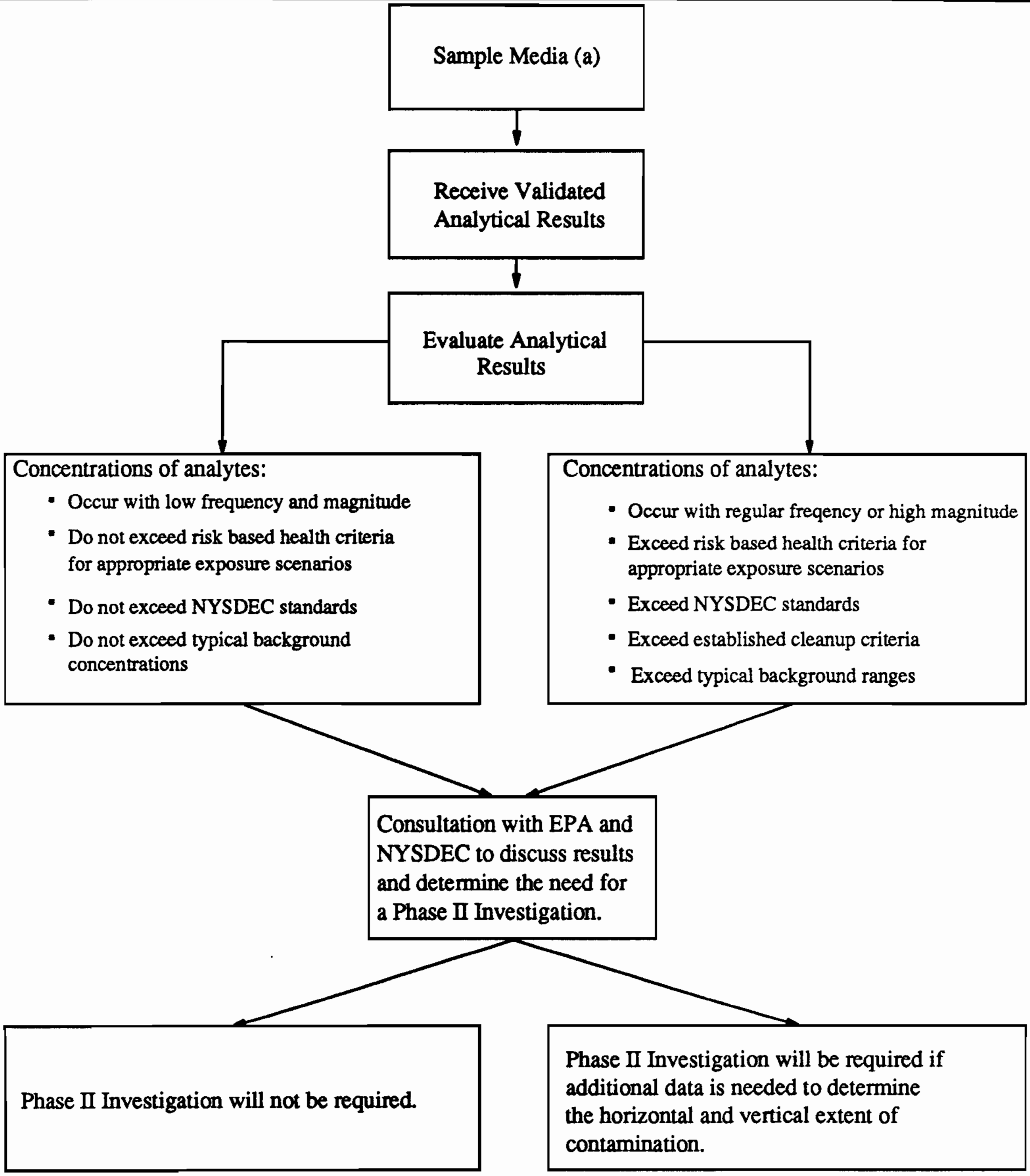
- Trash and debris will be placed in a trash dumpster and disposed of by a local garbage hauler.
- Auger cuttings from piezometer installation and soil segregated from the trenching which exceeded the field screening threshold will be collected on a Visqueen sheet or placed in

55-gallon containers. A composite sample from each piezometer will be taken and sent to a laboratory for characterization for disposal. A tarp will be placed over each pile while waiting for analysis. If the material is clean, it will be spread on the ground at each drilling location. If the material is contaminated it will be placed in 55-gallon drums or soil roll-offs and disposed of by a waste disposal subcontractor.

- Decon water will be pumped from the decon pad into 55-gallon drums, holding tanks or a tank truck for possible disposal by a subcontractor.
- Purge water will be collected in 55-gallon drums, holding tanks, or a tank truck for possible disposal by a subcontractor.
- All investigation-derived wastewaters will be collected, sampled, and analyzed for disposal characterization. The disposal methods will be contingent on analytical data.
- Used protective clothing and equipment will be appropriately managed.

5.3.7 Phase II Field Investigation

The Phase I investigation in this revision of the Work Plan has been structured to efficiently select Phase II activities which may be needed to assess contamination at the site. The logic for making decisions regarding the need for a Phase II investigation is provided in a flow diagram (Figure 5-7). The decision making process will be applied to each sample media (e.g., groundwater, soil, surface water, and sediment) and to each area of concern (i.e., trenches, drainage ditches), where applicable. The USEPA and the NYSDEC will be involved in the decision making processes. Phase II activities will be based on the Phase I data and may include, but are not limited to, the following:



a/ This logic process will be applied to each media (soil, groundwater, surface water, sediment, and air) and to each area (i.e., trenches, drainage ditches), when applicable.

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Figure 5-7

Decision Tree for Determining the Scope of the Phase II Investigation
Tri-Cities Barrel Site
Fenton, New York

- If contamination is found in Phase I, field screening techniques such as soil gas analysis may be used to delineate the extent of the contaminant plume. Based on the results of the Phase I samples, appropriate target compounds and analytical methods would be selected.
- If evaluation of recent aerial photographs indicates that drums may have been buried at the site since the 1985 geophysical survey, geophysical testing may be used as part of the Phase II investigation. Appropriate geophysical methods will be identified, as necessary.
- If Phase I groundwater and soil results indicate the presence of DNAPLs, it may be necessary to further delineate the bedrock surface using seismic refraction or additional soil borings. Appropriate methods to do the delineation will be identified, as necessary.
- Soil borings may be completed to delineate bedrock topography, investigate any additional former lagoons, define overburden facies changes, or investigate subsurface soil contamination.
- Additional trenching may be completed to investigate shallow soil contamination.
- If the review of records and interviews indicate that the section of the creek that borders the site has been dredged and the dredged material stockpiled next to the creek, the dredged material will be sampled to determine if this material has been affected by the former operations at the site.
- If contamination is detected in the soil samples collected north of I-88, a comprehensive soil investigation to delineate the extent of contamination will be conducted. This investigation will include establishing a grid system and collecting samples at depths of greater than 3 feet for both field screening and laboratory analyses.

- If contamination is detected in the surface water and sediment samples collected during the Phase I investigation, additional downstream samples will be collected from Osborne Creek.
- Based on sample data results, the decision whether to install groundwater monitoring wells will be made consistent with NCP requirements and will involve consultation with the USEPA and the state. The criteria identified in Figure 5-7 will be followed to determine the need for the installation of groundwater monitoring wells at the site. In addition, groundwater monitoring wells will be installed at the site if, based on water contour maps, a plume from a potential source area could be bypassing the existing monitoring wells, or if waste disposal or soil contamination is identified in areas not covered by the existing monitoring wells. The groundwater monitoring installation and construction procedures are provided in the SAP. Tentative well locations are shown on Figure 5-8. The locations of these tentative monitoring wells are based on the limited existing data and may be modified based on the results of the Phase I investigation. MW-10 will serve as an upgradient monitoring well and will replace MW-1 if MW-1 is determined to be unuseable. Likewise, MW-6 will replace MW-3 if MW-3 is determined to be unuseable. However, if the existing monitoring wells are determined to be useable, MW-6 and MW-10 will not be installed. The other five wells are positioned to intercept potentially contaminated groundwater from potential contaminant source areas. Based on the existing site data, these wells will be installed so that the well screens bracket the water table. Should the Phase I investigation data indicate that bedrock monitoring wells, well clusters, or piezometer clusters are necessary, such wells or piezometers will be installed at the site

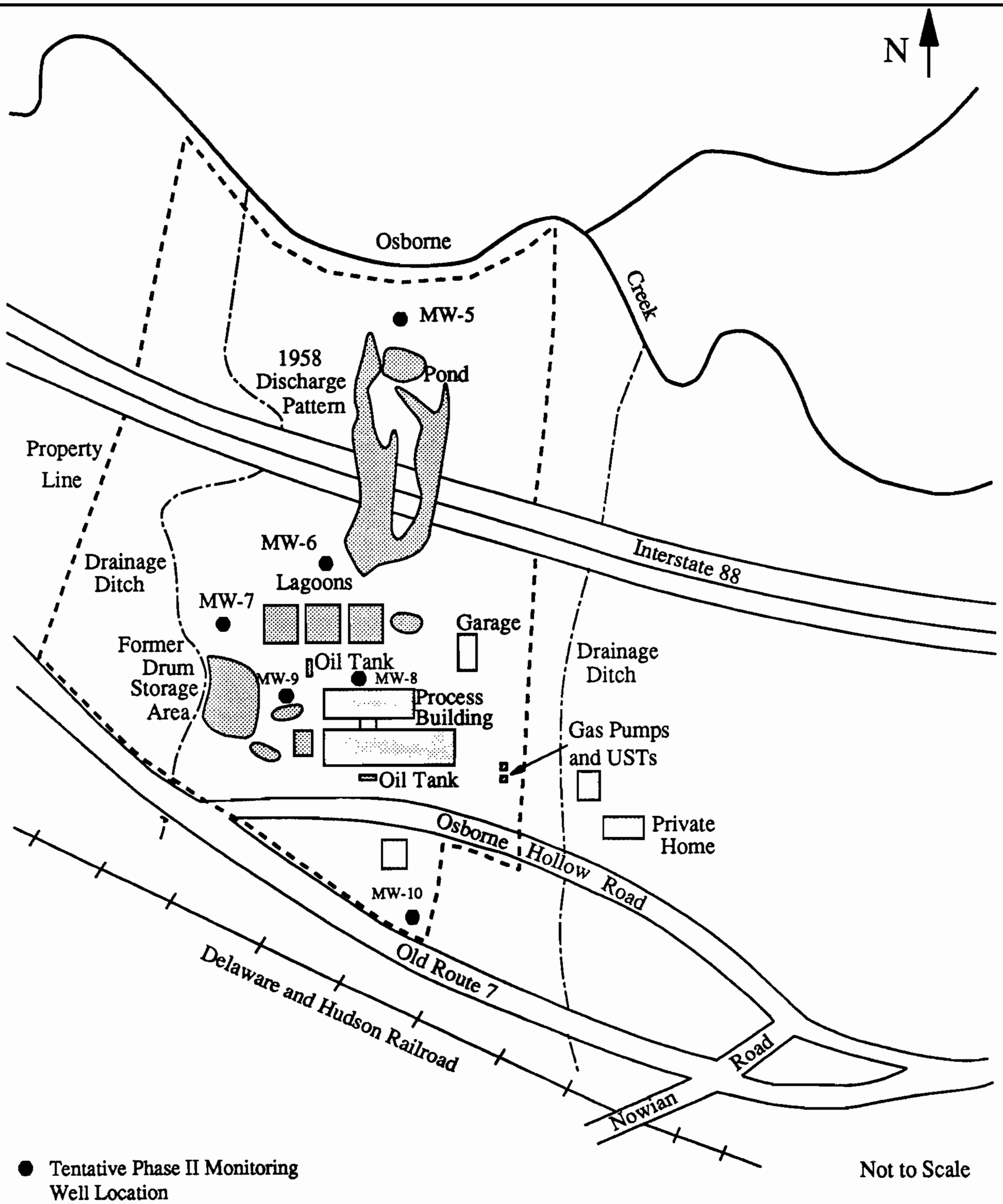

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Figure 5-8

Tentative Phase II Monitoring Well Locations, Tri-Cities Barrel Site Fenton, New York to determine the presence and magnitude of a vertical hydraulic gradient and to determine if the unconsolidated and bedrock water bearing zones are interconnected. These decisions will be made following the Phase I investigation with input from the EPA and state.

- At least one groundwater monitoring well will be installed north of I-88, and during drilling of the borehole(s) for the monitoring well(s), soil samples will be collected from depths of 3 feet to the water table and field screened for total VOCs. Based on the results of the field headspace analyses and field observations, up to two soil samples from each borehole will be submitted for laboratory analysis. The location(s) of the monitoring well(s) and the chemical analysis required will be based on the results of the Phase I investigation and will be determined in consultation with the U.S. EPA and the NYSDEC.
- The locations and elevations of all wells installed during the Phase II investigation will be surveyed.
- If groundwater monitoring wells are installed, aquifer testing may be conducted to determine the aquifer characteristics and to calculate the rate of groundwater flow at the site.
- It may be necessary to abandon the ES/D&M wells.
- Hydrogeochemical modeling may be required for the feasibility study to model contaminant distribution, maximum and minimum plume extent, and to model recovery well siting.
- If the surface water and sediment samples collected from the septic tank during the Phase I investigation are contaminated, additional information on the system will be collected

and a dye test will be performed if it is determined that a discharge point exists and its location is uncertain.

- If the results of the air monitoring conducted during the intrusive activities of the Phase I indicate minimal or no impact on the air quality, the air monitoring for the Phase II investigation will include monitoring of the worker's breathing zone using a PID with an 11.7-eV lamp. Otherwise, the Phase I air monitoring program will be continued during any intrusive activities planned for the Phase II investigations.
- If the VOC results of the soils are sufficiently elevated, an indoor air sampling program in the process building and nearby residence will be conducted.
- If the results of the samples collected during the building investigation indicate the presence of contamination in the process building which could cause a release of contaminants to the environment, additional sampling will be conducted during the Phase II investigation.

The actual scope of Phase II of the RI will be determined by the participating parties and presented for approval by the USEPA. It is anticipated that the scope of the Phase II work can be presented to the USEPA in a meeting to obtain technical concurrence on the work to be completed. A brief addendum to the Work Plan describing the Phase II activities and schedule would be prepared and submitted to the USEPA for approval before beginning the Phase II work. Following this approach, the Phase II investigation will begin within 2 weeks of receipt of USEPA approval of the Work Plan. A separate Phase I RI report will not be prepared unless the data indicate that a Phase II will not be necessary. Technical specifications for the Phase II work, including groundwater monitoring well installation and construction procedures, will be included in the Phase I QAPP and FSP.

5.3.8 Data Management

Data Management activities during the Field Investigation task of the Tri-Cities Barrel site RI/FS will be performed according to the prepared Data Management Plan and OSWER Directive 9355.3-01.

The Data Management plan will address procedures for consistent collection and identification of field samples and measurements. Data elements collected will include soil characteristics, sampling locations, sampling techniques, exceptions, and other information which is transcribed onto field logs.

5.4 Task 4 - Sample Analysis/Validation

5.4.1 Sample Management (CLP)

All environmental samples will be collected and analyzed according to USEPA Contract Laboratory Program (CLP) analytical and QA/QC procedures and a data validation program. The samples will be tracked from time of collection through the data validation process to assure that the integrity of the samples is maintained throughout the RI. Data validation will be performed to verify that the analytical results were obtained following the analytical QA/QC protocols specific to the CLP program and the QAPP.

5.4.2 Non-CLP Analysis

All samples will be subject to CLP protocols, but we are not part of the CLP.

5.4.3 Data Validation

Data validation is the assessment of data quality with respect to method requirements and technical performance. Analytical data packages will be examined to ensure that all lab components are included, all QC requirements were performed, and the data use restrictions are well defined. All samples obtained and analyzed will be subjected to data validation using the USEPA procedures provided in USEPA's guidance documents for data validation listed below:

- Laboratory Data Validation, Functional Guidelines for Evaluating Inorganics Analyses, USEPA, June 1988.
- Laboratory Data Validation, Functional Guidelines for Evaluating Organics Analyses, USEPA, November 1988.

The results of the data validation process will be contained in the RI report as a separate appendix. The data validation report will include data tables showing sample results and qualifiers before and after validation. A glossary of data qualifiers will also be included.

5.4.4 Sample Tracking

5.4.4.1 Data Management. Data Management activities during the Sample Analysis/Validation task for the Tri-Cities Barrel site RI/FS will be performed according to the prepared Data Management Plan and OSWER Directive 9355.3-01.

Samples will be tracked during the sampling activities, laboratory analysis, and data validation. During sampling, this task will involve ensuring that the proper documentation, chain-of-custody, and sample transport to the laboratory are performed. Sample tracking will begin when arrangements are made for sample container preparation and shipment and will include documentation of receipt of samples and extraction and analysis dates.

5.4.5 Data Management

Manual data entry will be minimized to the extent possible through the use of personal computers and software packages. The laboratories will submit all sample and supporting QA/QC data in duplicate (one bound and one unbound). All analytical results will also be supplied in electronic form (diskette deliverable).

The format for the diskette deliverable will be a flat ascii file with fixed length records. The file will contain the following sample specific information:

- Sample identifier
- Laboratory sample identifier
- Sampling date
- Analyte CAS number
- Analyte result
- Data qualifier
- Units

Entries for analyte result, data qualifier, and units will follow CLP reporting requirements.

On receipt, the data packages and diskette deliverable will be logged into a data management system. This will allow for efficient tracking and retrieval of all project data and deliverables. All data produced during the project investigations will be organized as tables of analytical results and stored in a computerized data base. The diskettes submitted by the laboratories will be used to electronically transfer the analytical data into the data base using the data management program. Data tables will then be generated from the data base.

Monthly progress reports will be submitted following the guidelines of OSWER Directive 9355.3-01.

5.5 Task 5 - Data Evaluation

Data collected during prior sampling programs and data from this RI will be assembled and carefully evaluated to satisfy the objectives of the investigation.

5.5.1 Data Reduction/Tabulation and Data Evaluation

The data collected to characterize the site will be organized and analyzed to identify the extent and nature of contamination in source areas and to determine groundwater flow direction(s). Field data and data resulting from laboratory analysis will be entered into a database to facilitate reporting and statistical analysis of data. Boring logs will be prepared for all completed borings, and stratigraphic information developed from the site borings and trenches will be displayed on cross sections or fence diagrams of the site. Water level elevations measured at the wells will be used to develop plot(s) of the piezometric surface in the WBZ. The horizontal hydraulic gradient will be determined as appropriate.

The water quality data will be evaluated and mapped to illustrate the areal extent of contaminants detected. The breakdown products of contaminants detected will be considered to help evaluate potential sources of the contaminants and their environmental behavior.

Maps of validated data from the previous sampling programs and from this RI will be prepared for each medium sampled (i.e., soil, sediments, surface water, etc.) to assist in the analysis. Tables comparing the results of the various subtasks of the RI will be prepared and evaluated. Where differences are observed, field and laboratory procedures, the passage of time, and other factors will be evaluated to interpret the differences. The results of the evaluation will be discussed in the RI report.

5.5.2 Data Management

Data Management activities during the Data Evaluation phase of the Tri-Cities Barrel site RI/FS will be performed according to the prepared Data Management Plan and OSWER Directive 9355.3-01.

This task will be completed as part of the overall task management plan.

Monthly progress reports will be submitted following the guidelines of OSWER Directive 9355.3-01.

5.6 Task 6 - Assessment of Risks

The assessment of risks posed by the presence of contaminants at the site will involve the generation of baseline risk assessments, both human health and ecological. The components of both assessments are described below.

5.6.1 Public Health Evaluation

A formal Public Health Evaluation will be conducted in accordance with the Risk Assessment Guidance for Superfund - Human Health Evaluation Manual, published by USEPA in 1989. In this manual, guidance is given on how to conduct the following steps in the public health evaluation:

- Selection of contaminants of concern.
- Evaluation of receptors and receptor point concentrations
- Development of exposure scenarios.
- Characterization of the toxicity potential of substances evaluated.

- Generation of risk calculations and discussion on risk outcome.
- Discussion of uncertainties associated with the risk assessment.

The major steps of the Public Health Evaluation are presented below.

5.6.1.1 Selection of Contaminants of Concern. This activity involves the selection of the contaminants of concern from the data collected in the RI in order to quantify risk potential. The data must be reduced into a manageable form so that a risk evaluation can be made. Data will be grouped by media, and individual sample data for each identified substance will be tabulated. The data will be evaluated for utility by comparison with quantification limits, blank contamination, and background levels. Contaminants present in each medium will be assembled and reduced to a mean (geometric or arithmetic, depending on the distribution) and an upper 95 percent confidence limit of the mean, provided that variability in the data does not cause the upper confidence limit value to exceed the maximum concentration detected and will be used to represent the reasonable maximum exposure (RME). (Note: Within certain limitations, the use of a maximum value is no longer appropriate in the risk assessment process. Rather, a reasonable maximum value is used in conformity with the reasonable maximum exposure (RME) concept discussed in the NCP (55 FR 8710)). The frequency of detection will be noted as well. Any data rejected will be noted, and reasons for rejection will be documented.

If the list of contaminants is extensive, the list will be further reduced by retaining those contaminants that present the greatest majority of risk and dropping the remainder. Substances presenting the majority of the risk are those present at high concentrations, those frequently detected and those possessing the greatest toxicity potentials (both carcinogenic and noncarcinogenic), and those with the greatest mobility potentials. This process may be qualitative or quantitative, as outlined in the Human Health Evaluation Manual.

5.6.1.2 Evaluation of Receptors and Receptor Point Concentrations. In this section, the selection of how exposure may occur will be presented. Evaluation of the land use surrounding the facility will culminate in establishing human receptors. Then, based on the reduced sample data, a concept of how those receptors may be exposed, to which substances exposure may occur, and the magnitude of such exposure that may occur will be derived. The intent will be to identify who may be at risk, how they may be at risk, and at what concentrations they may be exposed. This evaluation will be performed for persons currently living around the site and projections will be made for persons who might live around the site in the future.

All environmental media will be evaluated for the potential to pose risk of adverse health effects to exposed receptors. The results of the RI sampling could indicate, however, that one or more media such as air, surface water, sediments or offsite soils are not contaminated and that corresponding exposure scenarios for those media would not be appropriate for inclusion in the baseline risk assessment. In the event that an environmental medium is determined to be free of appreciable contamination, the rationale for its exclusion from further consideration in the risk assessment will be presented in this section.

The results of transport modeling, if needed, will be utilized in this section of the Public Health Evaluation. Also, comparison with ARARs will be made at this point.

5.6.1.3 Development of Exposure Scenarios. Exposure scenario development essentially consists of development of models (i.e., algorithms) that will be used to estimate the amount of contaminant that may enter the body. Modeling of exposure potential involves using the information on how the substances may be contacted (detailed in preceding subsection) and then deriving algorithms that estimate the magnitude of exposure over unit time and over a lifetime. Because the amount of contact a current or future resident might have with site-related contaminants will not be known, it is necessary to use assumptions regarding the frequency, duration and magnitude of exposure. A primary source of assumptive data will be USEPA's Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual Supplemental Guidance, "Standard Default Exposure Factors" (1991). The rationale used in establishing the exposure scenarios, assumptive or real, will be documented.

5.6.1.4 Characterization of Toxicity Potential. The carcinogenic and noncarcinogenic toxicity endpoints for each substance evaluated will be obtained. The primary source of such information will be USEPA's Integrated Risk Information System (IRIS), which contains the current cancer potency factors (CPFs) and reference doses (RFDs). When information is lacking (such as when an RFD is being re-evaluated), the last published endpoints, if available, will be used or appropriate health-based endpoint data will be generated by the toxicologists. The USEPA regional toxicologist will also be consulted when the need to develop health-based numbers is apparent. It is anticipated that the RFD information needed for the public health evaluation will be that representing chronic exposure.

5.6.1.5 Generation of Risk Calculations and Discussion of Risk Outcome. This segment of the Public Health Evaluation will use exposure algorithms to calculate doses and the toxicity information against which to compare doses and generate risk calculations. Risk, both carcinogenic and noncarcinogenic will be calculated for individual substances within a pathway, across a pathway and across all pathways. The substances within each pathway contributing to the majority of risk will be identified. In addition, the pathways demonstrating the most risk potential will be noted and discussed.

5.6.1.6 Discussion of Uncertainties Associated with the Risk Assessment. In most assessments, there are assumptions or data deficiencies that could be challenged. This final segment of the Public

Health Evaluation will include a discussion of potential uncertainties in the assessment. This section will present the level of confidence in the risk outcome and the reasons for this level of confidence. The intent of this segment of the Public Health Evaluation will be to assist the USEPA in identifying uncertain areas of the risk assessment and to let other readers know where the information is lacking so that informed remedial action decisions can be made.

5.6.2 Environmental Assessment

The second major portion of the baseline risk assessment is the ecological risk assessment. It will be conducted in conformity with the guidance set forth in USEPA's Risk Assessment Guidance for Superfund - Volume II, Environmental Evaluation Manual, published in March 1989.

The major thrust of the ecological risk assessment will be to use information found in any environmental impact study, etc. done during construction of I-88 or collected during the environment assessment and the sampling of media during the RI to establish the risk potential to area wildlife. If necessary, a description of site fauna and flora will be done as part of the Phase II RI to assist in characterizing the possible impacts of the site. The process will involve the selection of indicator species to establish the risk to ecological components. A three parameter wetlands delineation study will be conducted during the Phase I investigation and the results will be included in the ecological risk assessment. The nearest registered wetland is approximately 3 miles northeast of the site and is not anticipated to be affected by the site.

The process of conducting an ecological risk assessment is similar to that used in the public health evaluation in that there is a selection of contaminants of concern, a characterization of exposure potential and a characterization of risk or threat. The process differs, however, in that it is geared to assessment of impact through use of toxicity indicators other than cancer potency factors and reference doses. Finally, the process leads to conclusions regarding the extent of ecological impact posed by the presence of contaminants at the site and how those impacts influence the need for remediation.

Although the proximity of the site to a major highway somewhat reduces the quality of the terrestrial habitat, it is intended that ecological impact potential to terrestrial organisms be evaluated. Also, surface runoff and groundwater discharge to drainage ways leading to Osborne Creek suggest that organisms living in Osborne Creek be evaluated. The results of the sampling of soils and surface water and sediments in the drainage ways will be of primary importance in determining whether the assessment of potential impact to either habitat is qualitative or quantitative in nature. If the surface soil investigation on the site does not progress across property boundaries or extends only to a limited offsite area (i.e., one acre or less), there is no reason to perform a quantitative terrestrial evaluation. Similarly, if surface water and sediment sampling in the tributaries discharging to Osborne Creek does not indicate the migration of site-related substances, there is no reason to evaluate Osborne Creek in a quantitative manner. In lieu of a quantitative assessment for either habitat, the text of the risk assessment will contain the results of the soils investigation and/or the surface water and sediment investigation, and state the reasons for dismissal of either ecological component from formal evaluation.

5.6.3 Data Management

Data Management activities during the Assessment of Risk task for the Tri-Cities Barrel site RI/FS will be performed according to the prepared Data Management Plan and OSWER Directive 9355.3-01. As part of the preliminary characterization summary, the reports which are generated in the Data Evaluation task will assist in the identification and description of the contaminants of concern, the media of concern, and the site physical characteristics which help in the assessment of risk and the identification of location-specific ARARs. As part of this data management effort, available database systems such as IRIS and ENVIROFATE, will be accessed.

5.6.4 Task Management and Quality Assurance

Monthly progress reports will be submitted following the guidelines of OSWER Directive 9355.3-01.

5.7 Task 7 - Treatability Studies/Pilot Testing (Optional)

The preliminary scoping of the feasibility study involves the identification of both established and innovative remedial technologies for addressing contamination at the site. Technologies that meet remedial action objectives and pass an initial screening may require treatability studies, either in the laboratory or in the field. The purpose of these studies would be to evaluate the applicability, reliability, and cost-effectiveness of the technologies to the site and to develop engineering design/cost information for the technologies to facilitate a comparative evaluation.

At this point in the RI/FS process, the need for a particular treatability study cannot be identified, and therefore, no detailed scopes of work are provided. If additional data are gathered in the RI that suggest that a treatability study is necessary such studies will be proposed at that time.

5.8 Task 8 - Remedial Investigation Report

5.8.1 RI Report Preparation

After completion of Tasks 3, 4, 5 and 6, and Task 7, if undertaken, a Technical Summary of the Phase I activities will be prepared and submitted by the participating parties to USEPA and NYSDEC for review. This Summary will include the results of the Phase I investigation presented in this Work Plan as well as proposed RI work which may be conducted in subsequent phases. The results of the Phase I investigation will be communicated to the USEPA and the NYSDEC through meetings and monthly progress reports. Proceeding in this manner will expedite the completion of the RI while ensuring that the USEPA and the NYSDEC concur with the actions taken.

A RI Report will be prepared on completion of all phases, and may follow Phase I if subsequent phases are not necessary. The report will follow the latest USEPA formats as described in USEPA guidance documents such as the 1985 "Guidance on Remedial Investigation Under CERCLA" and the October 1988 Interim Final "Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA."

The Draft RI Report will include a discussion of the data from the previous sampling programs, where appropriate, and the data and analyses performed as part of this RI.

When the Draft RI Report is completed, it will be submitted by the participating parties to the USEPA and NYSDEC for review and comment. Within 20 business days of receipt of all USEPA and other federal and state agency written comments, the participating parties will submit a revised report to USEPA and the NYSDEC. When the USEPA and the NYSDEC determine that the report is acceptable, the report will be deemed the Final RI Report.

5.8.2 Data Management

Data Management activities during the Remedial Investigation Reports task of the Tri-Cities Barrel site RI/FS will be performed according to the prepared Data Management Plan and OSWER Directive 9355.3-01.

Data management support in this task will include the formation of reports and documentation of the data which was collected and analyzed in the other tasks. This information, which includes the verification of compliance with data quality objectives, will be supplied to the agency as data tables, graphics, and text, as part of the monthly progress reports or the RI Report.

5.9 Task 9 - Remedial Alternative Screening

After data from the existing database and that collected during the RI are evaluated (Tasks 3 through 6), the preliminary remedial action objectives will be refined if appropriate. Based on the revised remedial response objectives and the results of the risk assessment (Task 6), the initial screening of remedial alternatives will be performed according to the procedures recommended in "Guidance and Feasibility Studies under CERCLA" (USEPA 1986) and "Guidance for Conducting RI/FS under CERCLA" (USEPA 1988).

According to the latest guidance (USEPA 1988), the development of alternatives will be performed concurrent with the RI. This Work Plan includes a preliminary identification and discussion of alternatives, although the process of identifying and screening potential alternatives will be ongoing throughout the RI, as new technological and/or site-specific data emerge. The activities comprising Task 9 will accomplish the following objectives:

- Development of remedial response objectives and general response actions;
- Identification and screening of remedial technologies, and process options; and
- Development and screening of remedial alternatives.

5.9.1 Development of Remedial Action Objectives and General Response Actions

Based on data collected in the RI along with other existing data, the remedial action objectives will be developed. Before the development of these objectives, any significant site problems and contaminant pathways will be identified. Considering these problems and pathways, the remedial response objectives which would eliminate or minimize substantial risks to public health and the environment will be developed further, including a refinement of the ARARs with consideration given to site-specific conditions. Based on the response objectives, general response actions will be delineated to address each of the site problem areas and to meet the clean up goals and objectives. These response actions will form the foundation for the screening of remedial technologies. General response actions considered will include the "No Action" alternative as a baseline against which all other alternatives can be compared.

5.9.2 Identification and Screening of Applicable Technologies and Development of Alternatives

Based on the remedial action objectives and each identified general response action, potentially applicable treatment and disposal technologies will be identified. A medium-specific technology based prescreening of these potential treatment technologies for suitability as part of a remedial alternative will be conducted. Technology prescreening criteria will be based on eliminating general response actions that cannot be implemented technically at the site. Where several process options exist for a particular technology (e.g., generic kiln, infrared or circulating bed combustion), the process option for which most data exist and whose capacities/constraints match site conditions will be selected for further detailed evaluation. Final process selection may occur during the remedial design.

Technologies which may prove extremely difficult to implement, may not achieve the remedial objective in a reasonable time, or are not applicable and not feasible based on the site-specific conditions will be eliminated from further consideration.

A preliminary identification of technologies has been completed; the results of this activity are presented in Subsection 3.4 - Preliminary Identification of Remedial Action Alternatives. However, this preliminary identification will be revisited based on the results of the RI and the revised remedial response objectives. The revised list of potential remedial technologies/alternatives will be developed as part of Task 9.

The development of alternatives requires combining appropriate remedial technologies that were retained after the screening step in a manner that will satisfy the site remediation strategies or response objectives and refined based on the results of the RI. As required by SARA, remedial alternatives will be developed in each of the following categories:

- An alternative for treatment that would eliminate, or minimize to the extent feasible, the need for long-term management (including monitoring) at the site.
- Alternatives that would use treatment as a primary component of an alternative to address the principal threats at the site.
- An alternative that relies on containment, with little or no treatment but is protective of human health and the environment by preventing potential exposure and/or by reducing mobility.
- A "No Action" alternative.

Additionally, based on the results of the RI, the development of remedial alternatives may consider operable units as appropriate.

5.9.3 Screening of Remedial Alternatives

The list of potential remedial alternatives developed above will be screened. The objective of this effort is to reduce the number of technologies and alternatives for further analysis while preserving a range of options. This screening will be accomplished by evaluating alternatives on the basis of effectiveness, implementability and estimated cost as specified in the most recent USEPA guidance document (USEPA 1988). These screening criteria are briefly described below.

5.9.3.1 Effectiveness Evaluation. The effectiveness evaluation will consider the capability of each remedial alternative to protect human health and the environment. Each alternative will be evaluated as to the protection it would provide, and the reductions in toxicity, mobility or volume of contaminants which it would achieve.

5.9.3.2 Implementability Evaluation. The implementability evaluation will be used to measure both the technical and administrative feasibility of constructing, operating and maintaining a remedial action alternative. In addition, the availability of the technologies involved in a remedial alternative will also be considered.

Innovative technologies will be considered during the screening process if there is a reasonable belief that they offer potential for better treatment performance or implementability, fewer adverse impacts than other available approaches, or lower costs than demonstrated technologies.

5.9.3.3 Cost Evaluation. Cost evaluation will include estimates of capital costs, annual operation and maintenance (O&M) cost, and present worth analysis. These conceptual cost estimates are order-of magnitude estimates, and will be prepared based on:

- Preliminary conceptual engineering for major construction components.
- Unit costs of capital investment and general annual operation and maintenance costs available from USEPA documents (USEPA 1985c, 1985d).

5.9.4 Review Meetings

During the remedial alternatives screening task, meetings with USEPA and other involved agencies are anticipated to assure that the FS Report is prepared with consideration of all parties involved.

5.9.5 Data Management

Data Management activities during the Remedial Alternative Screening task of the Tri-Cities Barrel site RI/FS will be performed according to the prepared Data Management Plan and OSWER Directive 9355.3-01.

The information will be presented in a form which will allow the engineering professionals an ability to make an informed, defensible decision in the analysis and screening of alternative remedial technologies. As part of the data management scheme, available information databases such as CERCLIS, meteorological data, the RODS database, etc. will be reviewed.

5.9.6 Task Management and Quality Assurance

Monthly progress reports will be submitted following the guidelines of OSWER Directive 9355.3-01.

5.10 Task 10 - Detailed Evaluation of Remedial Alternatives

5.10.1 Evaluation Criteria

The remedial alternatives that pass the initial screening will be further evaluated. The evaluation will conform to the requirements of the National Contingency Plan, in particular, Section 300.68 (h), Subpart F, and will consist of a technical, environmental and cost evaluation as well as an analysis of other factors, as appropriate. The detailed evaluation will follow the process as specified in the "Guidance on Feasibility Studies under CERCLA" (USEPA 1985a), as updated in J.W. Porter's December 1986 and July 1987 Memoranda on "Interim Guidance on Superfund Selection of Remedy", and "Guidance for Conducting RI/FS under CERCLA" (USEPA 1988).

In the latest guidance (USEPA 1987; USEPA 1988), a set of nine evaluation criteria has been developed for the evaluation of each Remedial Alternative. Table 5-5 presents the nine evaluation criteria and the factors considered for each evaluation criteria. A brief description of each criterion is provided below:

5.10.1.1 Short-Term Effectiveness. This criterion addresses the effects of the alternative during the construction and implementation phase until the remedial actions have been completed and the selected level of protection has been achieved. Each alternative will be evaluated with respect to its effects on the community and onsite workers during the remedial action, environmental impacts resulting from implementation, and the amount of time until protection is achieved.

5.10.1.2 Long-Term Effectiveness. This criterion addresses the results of a remedial action in terms of the risk remaining at the site after the response objectives have been met. The primary focus on this evaluation is to determine the extent and effectiveness of the controls that may be required to manage the risk posed by treatment residuals and/or untreated wastes. The factors to be evaluated include the

Table 5-5
Detailed Evaluation Criteria

Short-Term Effectiveness

- Protection of community during remedial actions
- Protection of workers during remedial actions
- Time until remedial response objectives are achieved
- Environmental impacts

Long-Term Effectiveness

- Magnitude of risk remaining at the site after the response objectives have been met
- Adequacy of controls
- Reliability of controls

Reduction of Toxicity, Mobility or Volume

- Treatment process and remedy
- Amount of hazardous material destroyed or treated
- Reduction in toxicity, mobility or volume of the contaminants
- Irreversibility of the treatment
- Type and quantity of treatment residuals

Implementability

- Ability to construct technology
- Reliability of technology
- Ease of undertaking additional remedial action, if necessary
- Monitoring considerations
- Coordination with other agencies
- Availability of treatment, storage capacity, and disposal services
- Availability of necessary equipment and specialists
- Availability of prospective technologies

Cost

- Capital costs
- Annual operating and maintenance costs
- Present work analysis
- Sensitivity analysis

Compliance With ARARs

- Compliance with chemical-specific ARARs
- Compliance with action-specific ARARs
- Compliance with location-specific ARARs
- Compliance with appropriate criteria, advisories and guidance

Overall Protection of Human Health and Environment

State Acceptance

Community Acceptance

magnitude of remaining risk (measured by numerical standards such as cancer risk levels), and the adequacy, suitability and long-term reliability of management controls for providing continued protection from residuals (i.e., for assessment of potential failure of the technical components).

5.10.1.3 Reduction of Toxicity, Mobility, and Volume. This criterion addresses the statutory preference for selecting remedial actions that employ treatment technologies that permanently and significantly reduce toxicity, mobility or volume of the contaminants. The factors to be evaluated include the treatment process employed, the amount of hazardous material destroyed or treated, the degree of reduction expected in toxicity, mobility and volume, and the type and quantity of treatment residuals.

5.10.1.4 Implementability. This criterion addresses the technical and administrative feasibility of implementing an alternative and the availability of various services and materials required during its implementation. Technical feasibility will consider construction and operational difficulties, reliability, ease of undertaking additional remedial action (if required), and the ability to monitor its effectiveness. Administrative feasibility will consider activities needed to coordinate with other agencies (e.g., state and local) in regards to obtaining permits or approvals for implementing remedial actions.

5.10.1.5 Cost. This criterion will address capital costs, annual operation and maintenance costs, and present worth analysis.

Capital costs consist of direct (construction) and indirect (non-construction and overhead) costs. Direct costs include expenditures for the equipment, labor, and material necessary to perform remedial actions. Indirect costs include expenditures for engineering, financial, and other services that are not part of actual installation activities but are required to complete the installation of remedial alternatives. Annual operation and maintenance costs are post-construction costs necessary to ensure the continued effectiveness of a remedial action. These costs will be estimated to provide an accuracy of +50 percent to -30 percent.

A present worth analysis will be performed to evaluate expenditures that occur over different time periods by discounting all future costs to a common base year (e.g., usually the current year). This will allow the cost of remedial action alternatives to be compared on the basis of a single figure representing the amount of money that would be sufficient to cover all costs associated with the remedial action over its planned life. As suggested in the USEPA's guidance (1988), a discount rate of 5 percent will be considered unless the market values indicate otherwise during the performance of the FS.

5.10.1.6 Compliance with ARARs. This criterion will be utilized to determine how each alternative complies with applicable or relevant and appropriate Federal and State requirements, as defined in CERCLA Section 121.

5.10.1.7 Overall Protection of Human Health and The Environment. This criterion will provide a final check to assess whether each alternative meets the requirement that it is protective of human health and the environment. The overall assessment of protection is based on a composite of factors assessed under the evaluation criteria, especially long-term effectiveness and permanence, short-term effectiveness, and compliance with ARARs.

5.10.1.8 State Acceptance. This criterion will evaluate the technical and administrative issues and concerns New York State may have regarding each of the alternatives. The factors to be evaluated include those features of alternatives that the state supports, reservations of the state, and opposition of the state. NYSDEC will review and comment.

5.10.1.9 Community Acceptance. This criterion will incorporate public concerns into the evaluation of the remedial alternatives. Community input will be incorporated from public comment and from public meetings. A Responsiveness Summary will be prepared to address community concerns.

After each of the remedial alternatives has been evaluated against the nine criteria, a comparative analysis will be performed. This analysis will compare all the remedial alternatives against each other for each of the nine evaluation criteria.

5.10.2 Data Management

Data Management activities during the Remedial Alternatives Evaluation task of the Tri-Cities Barrel site RI/FS will be performed according to the prepared Data Management Plan and OSWER Directive 9355.3-01.

The information will be presented in a form which will allow the engineering professionals the ability to make an informed, defensible decision in the analysis and evaluation of alternative remedial technologies. As part of the data management scheme, available information databases such as CERCLIS, Meteorological data, the RODS database, etc, will be accessed.

5.10.3 Task Management and Quality Assurance

Monthly progress reports will be submitted following the guidelines of OSWER Directive 9355.3-01.

5.11 Task 11 - Feasibility Study (FS) Report

5.11.1 FS Report Preparation

An FS report will be prepared to summarize the activities performed and to present the results and associated conclusions for Tasks 5.1 through 5.10. A Draft FS will be prepared for USEPA comment.

The report will include a summary of laboratory treatability findings (if performed), a description of the initial screening study process, and the detailed evaluations of the remedial action alternatives studied. The FS report will be prepared and presented in the format specified in "Guidance for Conducting RI/FS under CERCLA" (USEPA, 1988).

The FS report will be comprised of an executive summary and six sections. The executive summary will be a brief overview of the FS and the analysis underlying the remedial alternatives which were evaluated.

The FS will contain the following six sections:

- Introduction and Site Background.
- Identification of ARARs.
- Identification and Screening of Remedial Technologies.
- Development and Initial Screening of Remedial Alternatives.
- Description and Detailed Analysis of Alternatives.
- Comparative Analysis.

A discussion of each component is presented below. The format proposed for use in developing the FS Report is presented in Table 5-6.

The introduction will provide background information regarding site location and facility history and operation and the nature of the problem, as identified through the various studies. A summary of geohydrological conditions, remedial action objectives, nature and extent of contamination, and risk assessment addressed in the RI report will also be provided. The feasible technologies and process options

Table 5-6

Proposed FS Report Format

Executive Summary

1.0 <u>Introduction</u>

1.1 Purpose and Organization of Report

1.2 Background Information (Summarized from RI Report)

1.2.1 Site Description

1.2.2 Site History

1.2.3 Nature and Extent of Contamination

1.2.4 Contaminant Fate and Transport

1.2.5 Baseline Risk Assessment

2.0 <u>Identification of ARARs</u>

2.1 Technical Specific

2.2 Action Specific

2.3 Location Specific

3.0 <u>Identification and Screening of Remedial Technologies</u>

3.1 Introduction

3.2 Remedial Action Objectives --

Presents the development of remedial action objectives for each medium of interest (i.e., ground water, soil, surface water, air, etc.). For each medium, the following should be discussed:

- Contaminants of interest
- Allowable exposure based on risk assessment
- Allowable exposure based on ARARs
- Development of remedial action objectives

3.3 General Response Actions --

For each medium of interest, describe the estimation of areas of volumes of which treatment, containment, or exposure technologies may be applied.

3.4 Identification and Screening of Technology and Process Options -- For each medium of interest, describes:

3.4.1 Identification and Screening of Technologies

3.4.2 Evaluation of Technologies and Selection of Representative Technologies

4.0 <u>Development and Initial Screening of Remedial Alternatives</u>

4.1 Development of Alternatives --

Describes rationale for combination of technologies/media into alternatives. Note: This discussion may be by medium or for the site as a whole.

4.2 Screening of Alternatives

4.2.1 Introduction

4.2.2 Alternative 1

4.2.2.1 Description

Table 5-6

Proposed FS Report Format
(continued)

4.2.2.2 Evaluation
- Effectiveness
- Implementability
- Cost
4.2.3 Alternative 2
4.2.3.1 Description
4.2.3.2 Evaluation
4.2.4 Alternative 3
4.2.5 Summary of Screening

5.0 Description and Detailed Analysis of Alternatives

5.1 Introduction
5.2 Individual Analysis of Alternatives
5.2.1 Alternative 1
5.2.1.1 Description
5.2.1.2 Assessment
- Overall Protection
- Compliance with ARARs
- Long-Term Effectiveness and Permanence
- Reduction of Mobility, Toxicity, or Volume Through Treatment
- Short-Term Effectiveness
- Implementability
- Cost
- State Acceptance
- Community Acceptance
5.2.2 Alternative 2
5.2.2.1 Description
5.2.2.2 Assessment
5.2.3 Alternative 3

6.0 Comparative Analysis
6.1 Overall Protection
6.2 Compliance with ARARs
6.3 Long-Term Effectiveness and Permanence
6.4 Reduction of Toxicity, Mobility, or Volume Through Treatment
6.5 Short-Term Effectiveness
6.6 Implementability
6.7 Cost
6.8 State Acceptance
6.9 Community Acceptance

for site remediation will be identified for each general response action, and the results of the remedial technologies screening will be described.

Remedial alternatives will be developed by combining the technologies identified in the previous screening process. The results of initial screening of remedial alternatives, with respect to effectiveness, implementability, and cost, will be described.

A detailed description of the cost and noncost features of each remedial action alternative passing the initial screening of the previous section will be presented. The detailed evaluation of each remedial alternative with respect to nine evaluation criteria, will be presented. A comparison of these alternatives will also be presented.

5.11.2 Data Management

Data Management activities during the Feasibility Study Reports task of the Tri-Cities Barrel site RI/FS will be performed according to the prepared Data Management Plan and OSWER Directive 9355.3-01.

Data from all previous tasks will be formatted and presented as part of the feasibility study report generation process.

5.11.3 Task Management and Quality Assurance

Monthly progress reports will be submitted following the guidelines of OSWER Directive 9355.3-01.

5.12 Task 12 - Post RI/FS Support (Optional)

5.12.1 Optional Activities

Because the participating parties will be completing the work, this task is not necessary.

5.12.2 Project Closeout

Project closeout activities will ensure data retention and transfer to the USEPA as necessary.

5.12.3 Task Management and Quality Assurance

The Site Manager will continue to coordinate any activities associated with the site through the designated USEPA Project Officer and continue to submit required status reports and data during this time.

5.13 Task 13 - Enforcement Support (Optional)

Because the participating parties will be completing the work, this task is not necessary.

5.14 Task 14 - Miscellaneous Support (Optional)

Because the participating parties will be completing the work, this task is not necessary.

5.15 Task 15 - ERA Planning (Optional)

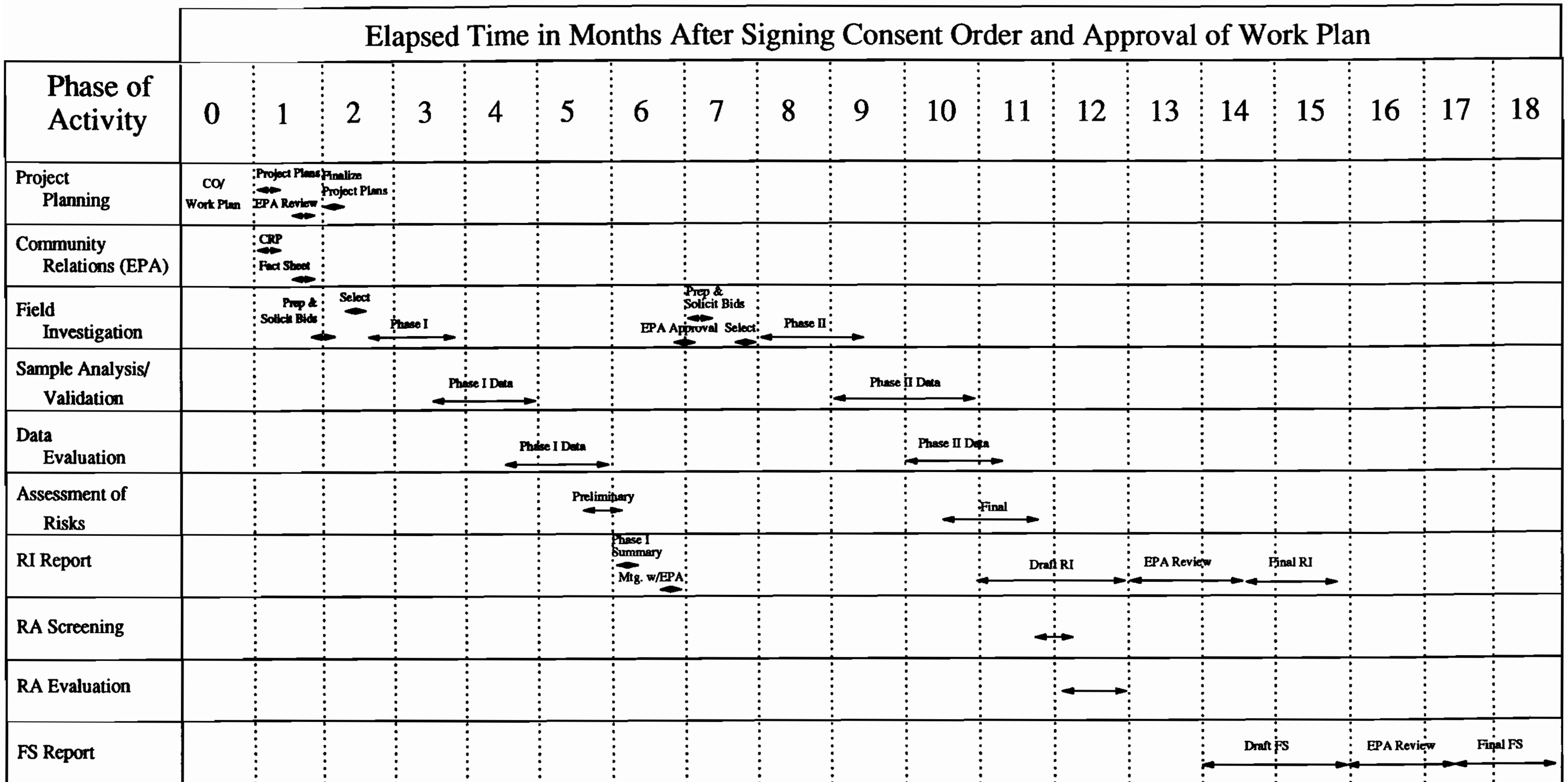
No ERA Planning has been scoped as part of this Work Plan. The USEPA has not informed the participating parties that emergency response actions are necessary. Based on current information, no immediate removal activities are thought to be necessary.

6.0 Schedule

A proposed schedule for the Tri-Cities Barrel site RI/FS process has been prepared and is shown in Figure 6-1. Because this is a proposed phased approach to RI activities at the site, assumptions have been made. Elapsed times for activities correspond to typical periods of time needed on previous RI/FS experience. The schedule is contingent on the time required for review by the agencies, site access, and potential weather related delays. The Phase I field work is expected to be completed in approximately one month.

The proposed schedule includes possible RI Phase II activities. Possible RI Phase II investigations were presented in Section 5. Actual RI Phase II activities will depend on results of the RI Phase I at the site. Possible RI Phase II activities are presented here for reference and are not included in this Work Plan.

Depending on agency approval of the Phase II, the estimated time to complete Phase II is approximately six months after the completion of the Phase I field work. It is also anticipated that the entire RI/FS can be completed in 18 months, significantly less than the 36 to 42 months proposed in the WESTON Work Plan.



Schedule is contingent on EPA approvals, site access, and weather delays.

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Figure 6-1
Proposed Schedule of Activities for the Tri-Cities
Barrel Company Facility in Fenton, New York

7.0 Project Management Approach

7.1 Organization and Approach

The proposed project organization is shown in Figure 7-1. The Site Manager will be responsible for the quality of the work performed at the Tri-Cities Barrel site. The progress of each work assignment will be monitored to ensure that the schedule is implemented and costs are controlled.

The Site Manager will have overall project team responsibility for implementation and maintenance of reporting systems such as critical path scheduling, financial control and reports, monthly progress reporting and communications with the Participating Parties Technical Committee. The USEPA RPM will be kept apprised of the project status by the Participating Parties Technical Committee and the Site Manager.

The Participating Parties Technical Committee in conjunction with the lead agency (USEPA) RPM, will be the focus for other agency and private participation in site activities and decisions. The Participating Parties Technical Committee or Site Manager will contact other agencies and private parties, when appropriate.

The Site Manager and project team will coordinate procurement and subsequent project related efforts of subcontractors working at site, develop contingency plans for potential problems, and will be responsible for project quality including development of the QA/QC plans, and review of specific QA/QC procedures.

The Remedial Investigation/Feasibility Study Leader will work with the Site Manager and Field Team Leader to develop the FSP as well as other documents, and will be responsible for implementing the field investigation, and interpretation and presentation of data acquired in the field. The RI/FS Leader

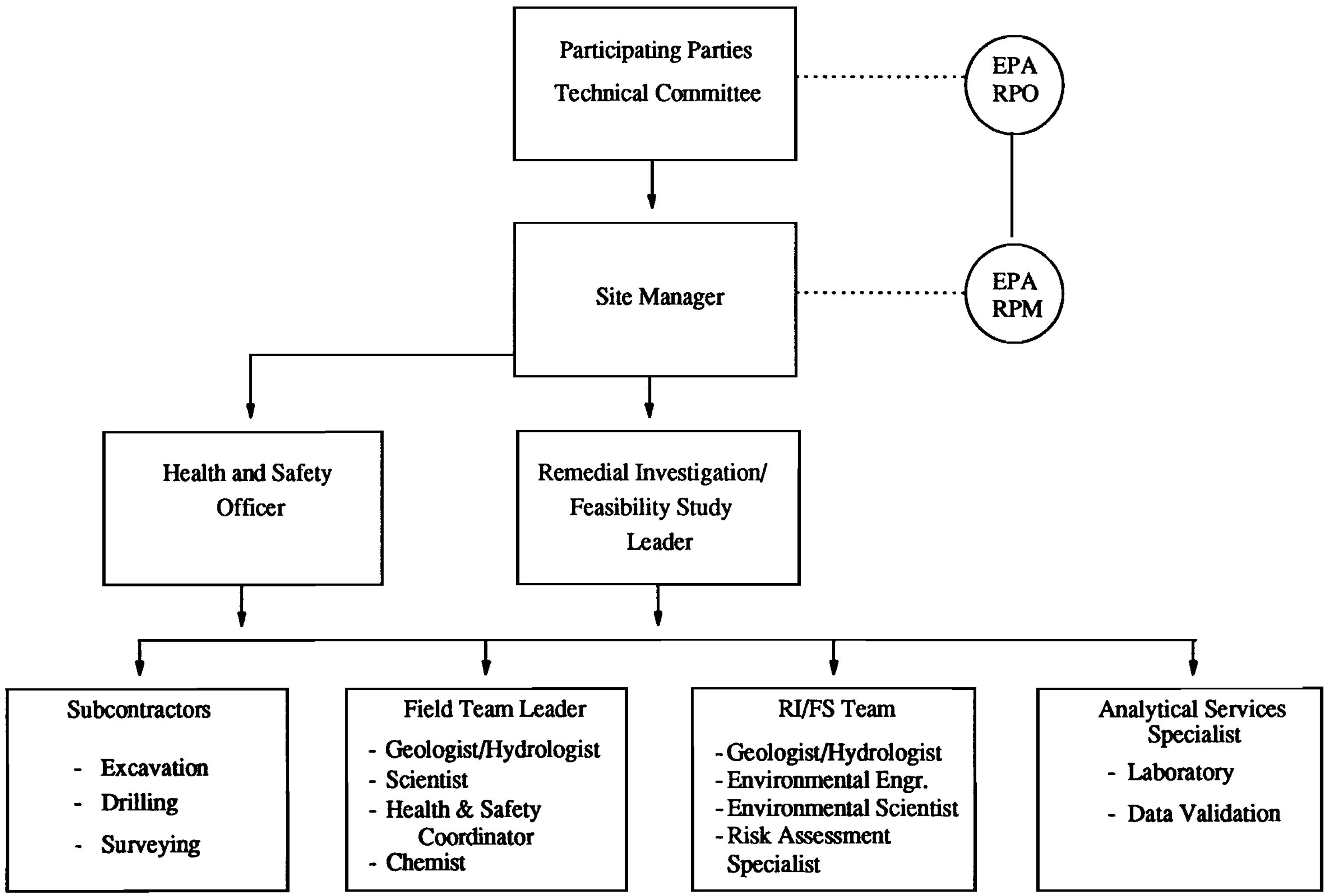

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Figure 7-1
Project Organizational Chart
Tri-Cities Barrel Site

will direct the team in the initial screening of remedial technologies and alternatives, and the development of the RI/FS report.

The Analytical Services Specialist will review coordination of the laboratory activities, plan and arrange for analytical services, and perform data validation.

The Field Team Leader will have responsibility for the technical performance for all sampling activities and QC during the site operations.

7.2 Quality Assurance and Document Control

The site-specific quality assurance requirements will be in accordance with the QAPP to be developed for the project and approved by USEPA.

8.0 Staffing Plan

Successful achievement of project goals can only be accomplished through the use of appropriate management techniques and personnel. ESC management personnel, identified in the following sections, will direct the project to ensure the timely completion of all Work Plan tasks with the highest possible technical quality. The multidisciplined proposed ESC team, presented in Figure 8-1, has significant experience allowing ESC to effectively and efficiently plan and implement the Tri-Cities RI/FS. Figure 8-2 illustrates the relevant work experience of the key ESC staff. Resumes of the project team are included. Brief biographies of key personnel for this project are presented below.

The following section outlines the approach to management procedures, discusses accountability and delegation of authority from the Site Manager to other key personnel, and presents the proposed procedures to provide any services requested by the Participating Parties.

Proposed key team members identified include:

- Site Manager - Joseph T. McNally, P.G.
- RI/FS Leader - Keith B. Johns, P.G.
- Field Team Leader - Kenneth G. Ogilvie
- Engineer Technical Support - James P. Hannan, P.E.
- Geology/Hydrology Technical Support - Patrick T. Peterson, E. Michael Riggins
- Risk Assessment Specialist - William Phillips
- Analytical Services Specialist - Sharon Dixon

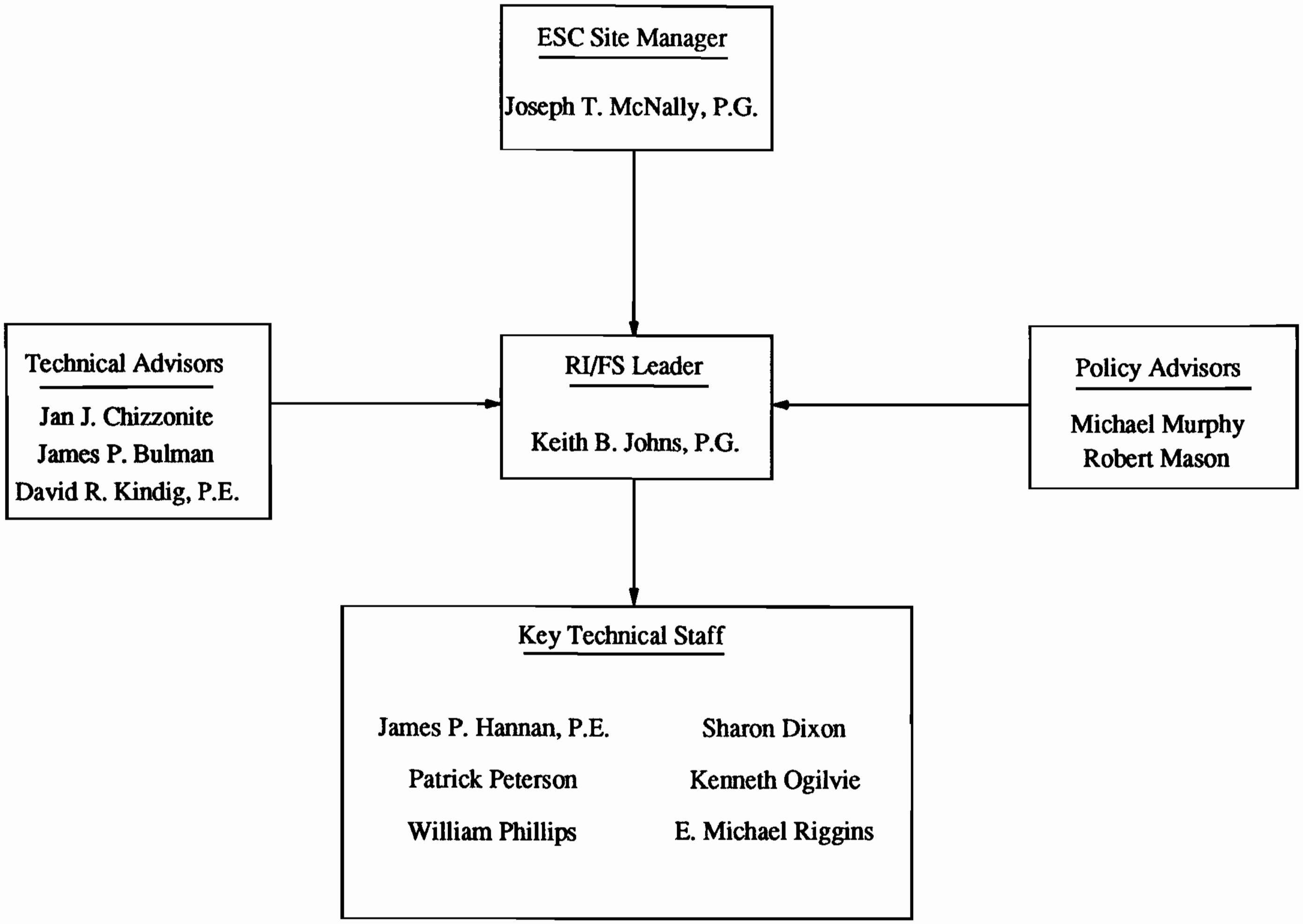

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Figure 8-1
Project Organization

AREAS OF EXPERIENCE / PERSONNEL NAME	PLANNING AND IMPLEMENTATION OF SITE INVESTIGATIONS							CERCLA/RCRA COMPLIANCE		OTHER RELEVANT EXPERIENCE	
	Work Plan Development	Hydrogeological Studies	Multi-Media Sampling	Analysis of Data	Risk Assessment	Alternatives Analysis	Remedial Action Plans	Waste Characterization	Waste Management Arrangements	Regulatory Negotiations	NYSDEC and EPA Region II Experience
J. Bulman	●	●	●	●	●	●	●	●	●	●	●
J. Chizzonite	●	●	●	●	●	●	●	●	●	●	●
S. Dixon	●		●	●	●						
J. Hannan	●	●	●	●	●	●	●	●	●	●	●
K. Johns	●	●	●	●	●	●	●	●	●	●	●
D. Kindig	●	●	●	●	●	●	●	●	●	●	●
R. Mason	●		●	●	●	●	●	●	●	●	●
J. McNally	●	●	●	●	●	●	●	●	●	●	●
M. Murphy	●	●	●	●	●	●	●	●	●	●	●
K. Ogilvie	●	●	●	●	●	●	●	●	●	●	●
P. Peterson	●	●	●	●		●		●	●		●
W. Phillips	●		●	●	●	●	●			●	●
M. Riggins	●	●	●	●		●		●	●	●	●

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Figure 8-2

Work Experience of Key ESC Staff

- Policy Advisors - Michael J. Murphy
  Robert J. Mason
- Technical Advisors - Jan J. Chizzonite
  James P. Bulman
  David R. Kindig, P.E.

Community relations aspects of this project will be carried out by the USEPA with assistance from the Participating Parties, as required.

8.1 Key Personnel

8.1.1 Project Management Personnel

The Site Manager for the Tri-Cities Barrel investigation will be Joseph T. McNally. Mr. McNally, Regional Director of ESC, has directed numerous remedial investigations and cleanups. Before joining ESC, Mr. McNally was employed as an environmental consultant for 10 years working on hazardous waste site investigations and feasibility studies. Mr. McNally has a broad range of experience in preparing and completing field sampling and investigation projects.

A primary focus for successful project execution rests with the RI/FS Leader. The RI/FS Leader, with the assistance and guidance of the Site Manager, will implement, monitor, and maintain all commitments on this assignment. Overall schedule, budget, and quality responsibilities and accountabilities belong to the Site Manager. Keith Johns will serve as RI/FS Leader. Mr. Johns, Senior Hydrogeologist at ESC, has managed complex soil and groundwater site investigations for a variety of facilities and environmental conditions. He is experienced in developing and implementing comprehensive

Work Plans that address complex technical and regulatory issues associated with environmental investigations. Mr. Johns has 5 years of environmental consulting and site investigation experience. He has completed projects in New York State and has worked closely with environmental regulators to successfully complete projects. Mr. Johns' technical background is in geology and hydrogeology. In addition, he has extensive knowledge of field investigations and regulatory compliance experience.

8.1.2 Policy Advisors

ESC will devote two Senior Managers to provide peer review and to assist in the analysis of policy issues. The two policy advisors will be Michael J. Murphy and Robert J. Mason.

Michael J. Murphy, Chairman and Chief Executive Officer of ESC, has been extensively involved in the development of risk analysis, environmental policy, and technical risk assessment programs. He was appointed to the Expert Advisory Consultation on Environmental Risk Management of the World Health Organization, European Office, Copenhagen. He recently testified on waste policy issues before the United Kingdom (UK) House of Lords to assist in the debate on establishing UK waste policy.

Robert J. Mason, Senior Vice President at ESC, has 12 years of broad-based experience. Mr. Mason has participated in successful investigations and site remediations with the NYSDEC. Mr. Mason was formerly Chief of the Guidance Section in the USEPA Superfund Enforcement Headquarters Office. He had responsibility for development of national Superfund enforcement policy and guidance related to removal and remedial programs. Mr. Mason participated in the development of the initial CERCLA statute and received a Gold Medal as a member of the USEPA Superfund Reauthorization Task Force. He assisted in development of the NCP, served on the USEPA Superfund Emergency Response Task Force, and provided on-scene expertise at numerous hazardous materials sites.

8.1.3 Technical Advisors

ESC anticipates that complex technical issues will arise during the investigation of the Tri-Cities Barrel site. ESC has identified three ESC Senior Managers, Jan J. Chizzonite, James P. Bulman, and David R. Kindig, to assist in the resolution of these issues. These managers can draw on over 35 combined years of directly related environmental experience to guide the site investigation.

Mr. Chizzonite, Vice President of Operations at ESC, has directed and managed numerous remedial investigations and cleanups. He has extensive experience in regulatory development and compliance pursuant to RCRA and CERCLA. Before joining ESC, Mr. Chizzonite managed corporate environmental compliance programs, performed site assessments and investigations, and directed the work of numerous consultants and subcontractors.

Mr. Bulman, Vice President of Technical Operations at ESC, has directed numerous remedial investigations and feasibility studies for NPL sites under Superfund, as well as sites under USEPA and state enforcement orders. Mr. Bulman has served as Site Manager for numerous NPL site responses. He has also conducted environmental audits of manufacturing and system media facilities. Before joining ESC, Mr. Bulman was employed by the USEPA, where he managed development of technical aspects of hazardous waste regulations. At the USEPA, Mr. Bulman also was responsible for developing hazardous waste technical guidance documents and assessing dioxin-contaminated sites. Mr. Bulman also has a broad range of experience in preparing and completing field sampling and investigation projects.

Mr. Kindig, Senior Engineer at ESC, has extensive experience in remedial investigations and cleanups, environmental risk assessments, and environmental compliance audits for domestic and international clients.

8.2 Project Management

ESC will plan the work effectively, execute the work efficiently, and identify and correct any problems quickly. ESC will accomplish these objectives by providing the Site Manager with a weekly breakdown of the schedule and costs expended on each task. The Participating Parties will be routinely apprised of project schedule, technical issues, and investigation findings.

Project management efforts will focus on monitoring the progress of each task. The procedures to be used are summarized below.

- The RI/FS Leader will be responsible for and track the day-to-day progress of the project.
- The RI/FS Leader will hold weekly review and planning meetings with all technical staff, during which current progress and future direction will be discussed.
- The RI/FS Leader and Site Manager will address any problems immediately. The Site Manager will inform the Participating Parties of progress, plans, and any anticipated problems on a routine basis. The Site Manager, using ESC resources, will provide proposed solutions to any problems.
- The Site Manager will provide the RI/FS Leader with labor and expense information, schedule data, and personnel availability information. The Site Manager and RI/FS Leader will work together to plan the project tasks, remedy potential problems, and determine the cost and time required to complete activities.

- The Site Manager will receive management support from ESC's senior management, who will assist in developing the management plan and strategies and will ensure that the project proceeds on schedule. ESC's senior management will also provide overall QA/QC for the project.

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10.0 Glossary of Abbreviaitons

ARARs	Applicable or Relevant and Appropriate Requirements
ARCS	Alternative Remedial Contract Strategy
ATSDR	Agency for Toxic Substance and Disease Registry
bgs	Below ground surface
CEQ	Council of Environmental Quality
CERCLA	Comprehensive Environmental Response Compensation and Liability Act. Also known as Superfund.
CLP	Contract Laboratory Program
CPF	Cancer Potency Factors
CPM	Critical Path Management
CRP	Community Relations Plan
DCE	Dichloroethene
DNAPLs	Dense, Nonaqueous Phase Liquids
DQOs	Data Quality Objectives
ECRA	Environmental Cleanup Responsbility Act
EIS	Environmental Impact Statements
ESC	Environmental Strategies Corporation
ES/D&M	Engineering Science/Dames & Moore
FAR	Federal Acquisition Regulations
FID	Flame Ionization Detector
FS	Feasibility Study

FSP	Field Sampling Plan
FWPCA	Federal Water Pollution Control Act
GC	Gas Chromatography
GPR	Ground-Penetrating Radar
GS/MS	Gas Chromatography/Mass Spectrometry
HASP	Health and Safety Plan
HRS	Hazard Ranking Score
ICP	Industively Coupled Plasma
ICPES	Industively Coupled Plasma Emission Spectroscopy
IRIS	Integrated Risk Information System
LNAPLs	Light, Nonaqueous Phase Liquids
LOE	Level of Effort
MCLs	Maximum Contaminant Levels
MW	Monitor Well
NAAQS	National Ambient Air Quality Standards
NAPL	Nonaqueous Phase Liquids
NCDC	National Climatic Data Center (a branch of the NOAA)
NCP	National Contingency Plan
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
NYSDEC	New York State Department of Environmental Conservation

NYSDOT	New York State Department of Transportation
OSHA	Occupational Safety and Health Administration
OSWER	Office of Solid Waste and Emergency Response
OVA	Organic Vapor Analysis
PAHs	Polycyclic Aromatic Hydrocarbons
PCBs	Polychlorinated Biphenyls
PID	Photoionization Detector
PMIS	Project Management Information System
PMO	Project Management Office
PRPs	Potentially Responsibly Parties
QA/QC	Quality Assurance/Quality Control
QC	Quality Control
QAPP	Quality Assurance Project Plan
RCRA	Resource Condensation and Recovery Act
RFD	Reference Doses
RI	Remedial Investigation
RI/FS	Remedial Investigation/Feasibility Study
RME	Reasonable Maxiumum Exposure
ROD	Record of Decision
RPM	Remedial Project Manager
SAP	Sampling and Analysis Plan
SARA	Superfund Amendment Reauthorization Act

SAS	Special Analytical Services
SB	Soil Boring
SPDES	State Pollutant Discharge Elimination System
Superfund	See CERCLA
TAL	Target Analyte List
TBC	To Be Considered
TCA	Trichloroethane
TCB	Tri-Cities Barrel (as abbreviated on some figures)
TCE	Trichloroethene
TCL	Target Compound List
TSCA	Toxic Substances Control Act
UK	United Kingdom
U.S.P.S	United States Postal Service
USTs	Underground Storage Tanks
VOCs	Volatile Organic Compounds
USEPA	United States Environmental Protection Agency
USGS	U.S. Geological Survey
VLF	Very Low Frequency
WACR	Work Assignment Completion Report
WBS	Work Breakdown Structure
WBZ	Water Bearing Zone
WESTON	Roy F. Weston, Inc.