SUPPLEMENTAL REMEDIAL INVESTIGATION AND FEASIBILITY STUDY

Volume I - Report

ROBESON INDUSTRIES CORPORATION

SITE NO. 961008

TOWN OF CASTILE, WYOMING COUNTY

Prepared by:
New York Department of Environmental Conservation
Division of Hazardous Waste Remediation
Region 9

August 1994

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1.0 INTRODUCTION

This report presents the results of a supplemental investigation performed by NYSDEC and URS Consultants Inc. during the period October 1993 through January 1994. In 1992 Robeson Industries Corp. signed an Order on Consent which required the company to perform a Remedial Investigation and Feasibility Study (RI/FS). However, in September 1993, the company filed bankruptcy and all work came to a halt. A draft RI/FS had been completed and submitted by this time.

The earlier field work performed by Robeson's consultant - Dames & Moore - had essentially been completed as outlined in the January 1992 - <u>RI/FS Work Plan</u>. The draft RI report was submitted for NYSDEC review in February 1993. Based on information obtained during the RI activities, concerns were identified for areas of the site regarding potential sources of contamination and the possible migration of these contaminants.

These concerns were the result of the following conditions being identified in three areas during the course of the RI:

* trichloroethene (TCE) was detected at concentrations of 6.2 ug/l in groundwater at Well MW-1, previously considered a background monitoring well for the site;

* TCE was also detected at concentrations of 52 ug/l in groundwater from the West Interior Production Well, a well which is presumably completed as a bedrock well at a depth of 260 feet below grade;

* groundwater quality in the areas off-site to the west of the site was unknown due to a complex relationship of groundwater/surface water and a lack of information as to groundwater flow patterns and contaminant transport in this area.

As a result of the above outlined conditions encountered during completion of the RI program, it was necessary to further investigate these areas to fully understand contaminant and hydrological site conditions. This information would be used to develop a conceptual model of site conditions and for development of specific remedial objectives for these areas. Since the company had filed for bankruptcy and no longer could undertake the work, DEC authorized URS Consultants to complete the RI/FS. This work was begun in October 1993 and was completed in January 1994.

This Supplemental Investigation (SI) Report summarizes previous information obtained during the course of the remedial investigation program. All activities which are presented in this report were completed using the same protocols, field methods, quality control/quality assurance procedures, and health and safety requirements as presented in the January 1992 RI/FS workplan for the site. Analysis was performed for volatile organic contaminants (VOCs) only.

2.0 AREAS OF INVESTIGATION

2.1 Monitoring Well MW-1 Area

Aerial photographs taken of the site during construction activities for a building expansion in 1976 identified several apparent drainage ditches originating from around the north and west sides of the original building. Figure 1 illustrates the location of the drainage ditches and other related areas identified from the 1976 site photographs. Based upon soil gas data, the areas north and west of the original building, (now beneath a portion of the newer building), is suspected to contain residual amounts of TCE and other contaminants from past plant disposal practices. Therefore, these areas were identified as potential source areas. The designation of the area west of the original building as a source area was further supported by results of the soil vapor survey, groundwater contaminant data, and groundwater flow patterns identified through the course of the investigation.

The 1976 photos also revealed that soil excavated near the north and west sides of the original building was apparently used as fill in the general area of well MW-1 (*please refer to Figure 2-5*). TCE was detected at low levels (6.2 ug/l), and because the soil material may have contained residual contamination it was decided to further investigate this area.

To determine if detection of TCE in well MW-1 was anomalous, groundwater sampling of this well was repeated. Analytical results are presented in the Tables which do <u>not</u> confirm TCE contamination. TCE was not detected in the October 1993 sampling versus 6.2 ug/l in October 1992. It is noted the groundwater standard for TCE is 5 ug/l.

To address and evaluate subsurface soil conditions in the area of well MW-1, three shallow soil borings were completed at locations shown on Figure 2-5, designated Soil 1, Soil 2 and Soil 3. The borings were completed using hollow stem auger techniques to depths of ten feet below grade surface. From each of the soil borings, a single soil sample was collected for laboratory analysis of VOCs (EPA SW-846, Method 8240). Soil samples were selected based upon field observations and headspace testing. Analytical data is presented in the Tables, which indicates that acetone and 2-butanone were found at levels less than 220 ug/kg ~~or~~ (parts per billion). It is noted that these two parameters are commonly found due to laboratory contamination. In this case, the levels of contamination is also below typical cleanup values used at site remedial activities for soil. No TCE was found, which coupled with the failure to find TCE in the groundwater leads to the conclusion that a source of contamination in this area does not exist.

2.2 West Interior Production Well

TCE had been detected previously at concentrations of 59 ug/l in groundwater collected from the

West Interior Production Well. This well was originally used for water supply purposes prior to obtaining municipal water supply service for the site. The well is constructed of 4-inch diameter steel casing extending to an unknown depth with the total depth of the well being approximately 260 feet. Presumably, the well is completed as a bedrock well producing water from the underlying shale-sandstone/siltstone units with the steel casing extending down to the top of bedrock, a depth in excess of 100 feet. A potential downward groundwater gradient is present between this well and the overlying shallow water table aquifer of concern based upon the difference in water level measurements in the deep well and in the shallow aquifer system. Water levels in the deep well are approximately 40 feet below grade and the water table aquifer is approximately 23 feet below grade.

Geologic conditions at the site consist of an upper layer, approximately 30 feet thick, of brown glacial moraine deposits of silt sand overlying a dense, grey till which extends to a depth of greater than 50 feet below the upper glacial moraine material and serves as a confining material for the upper shallow aquifer (*please refer to Figures 3-2 and 3-3*). The upper shallow water table aquifer is confined above the underlying grey till, with water encountered at depths of 10-25 feet below grade across the site. Due to the consistency and vertical and horizontal extent of the underlying grey till, the likelihood of downward migration of groundwater and contaminants through the grey till is minimal.

Two possible scenarios for the presence of TCE in this well:

* past solvent disposal practices including disposal of material into the well,
* contaminated groundwater from the shallow water table aquifer migrating vertically downward along the borehole and well casing or into the well through a deteriorated well casing causing contamination of groundwater in the deep production well.

To verify the occurrence of TCE in the West Production Well, groundwater from this well was resampled for laboratory analysis of VOCs. Groundwater sampling consisted of purging the well over an extended period of time and sampling. The well was purged by pumping at a flow rate of approximately 4-6 gallons per minute for a continuous period of ten hours, over which time four samples were taken at sequential time intervals. The first sample was taken during the first hour of pumping and the remaining three samples were taken at three hour intervals afterward. All samples were analyzed for VOCs using ASP91 protocols.

The analytical data as presented in the Tables found no quantifiable VOCs present in any of the four samples with the exception of xylene at 14 ug/l taken during the first hour of pumping. These results indicate the earlier finding of TCE was most likely due to contaminated groundwater from the upper aquifer finding its way down the casing. Purging and continuous pumping eliminated the presence of VOCs in the lower aquifer.

2.3 West Off-Site Areas

VOCs, mainly TCE and 1,1,1-trichloroethane (TCA), have been detected in surface water and sediment in groundwater discharge areas west of the site property boundaries. The areas of highest groundwater contamination exist along the west side of the site as shown by data from wells MW-D, MW-X, MW-5, MW-3, and MW-C (*please refer to Figures 4-6 and 4-7*). Groundwater flow has been identified as flowing in a west-southwest direction across the site. However, the influence of the groundwater discharge areas (seeps) on groundwater flow patterns and contaminant pathways west of the property boundary was difficult to to assess due to a lack of data in this area.

To further investigate this area, four shallow groundwater monitoring wells were installed. Two wells were installed to the north of the discharge stream and two to the south (*please refer to Figure 2-5*). As a result of the steep terrain and wooded condition of the area, these wells were installed using manual construction techniques. The wells were constructed of 1.5 inch PVC casing with pre-packed PVC screens. Well depth ranged from 11 feet at MW OF-4, MW OF-5 and MW OF-6 to 14 feet at MW OF-3. Monitoring well borings were sampled continuously from ground surface to termination depth for soil characterization. Following installation of the four new off-site wells, the wells were developed and groundwater samples taken. Field work was completed on November 3, 1993. The wells were surveyed on November 23, 1993. Hydraulic conductivity testing of the new wells plus some existing wells was performed in January 1994. Additional samples of the new wells were obtained on January 14, 1994.

Groundwater elevation data is presented in Figure 3-4 which confirms earlier data regarding flow patterns i.e. that groundwater flows in a westerly direction and the groundwater closely parallels the surface features. It appears from the data that the seep area immediately west of the site may not influence the the groundwater flow and contaminant patterns as much as previously thought. The influence of the seep area may be limited to periods of higher seasonal recharge such as spring and fall when higher water table may intersect the ground surface.

Analytical data shown in the Tables found extremely elevated levels of acetone in the November 1993 samples which were considered to be a laboratory error. The wells were resampled in January 1994 and the values for acetone were quite low or non-detect which supports the concept that acetone is a laboratory artifact. The data also confirmed that the furthest off-site wells, MW OF-1 and MW OF-2, are not contaminated with TCE. The new off-site wells find the plume has encountered wells OF-3 (TCE = 1500 ug/l), well OF-5 (TCE = 26 ug/l) and well OF-6 (26 ug/l). The levels drop off considerably from the levels found on the property boundary (typically equal to 5000 - 12,000 ppb). The groundwater standard for TCE is 5 ug/l.

3.0 SUMMARY OF THE REMEDIAL INVESTIGATION

This section of the report provides a summary of the conclusions based upon this work as well as previous investigative work performed at the site. These conclusions are to be supplemental in nature to section 7.0 of the draft Remedial Investigation Report dated February 1993 by Dames & Moore.

3.1 Soils

A soil gas survey performed in the earlier field work identified TCA, TCE and other chlorinated compounds as being present in subsurface soils. These compounds were found in the northwest areas of the site and under the newer and older portions of the building. Figure 4-2 illustrates the results for TCE, which show moderate and elevated response levels being detected. According to the final report on the findings of the Petrex Soil Gas Survey, dated January 5, 1993 - [regarding TCE] "the areas of highest response are generally interpreted to be a large source area trending northeast-southwest beneath the building".

Soil samples were collected from various areas of the site from borings and surface locations. Additional samples were taken during this study in the area of MW-1 (*please refer to Figure 2-5*). The data from the earlier work conducted under the RI indicates that TCA and TCE were the most prevalent compounds found in soils, and the highest value was equal to 450 ug/kg (parts per billion) for TCE [located immediately North of the building at sampling location B-1A (0-3')]. It must be noted, however, that soil sample analysis is not available from areas suspected to be the major source area, i.e. under the building foundation near DW-A and INT.MW-1. Samples were taken during additional work performed by Dames & Moore in March - April 1993, however, due to the bankruptcy issue this data was never submitted to DEC.

The data from soil samples, vapor analysis of split spoon samples and the soil gas survey indicate that soil contamination is limited to underneath and alongside the building in the north-northwest area. An elevated reading from the boring for DW-6 is noted, however, data from groundwater taken from wells DW-6 and MW-6 find the groundwater to meet standards. It is noted that this is near an underground storage tank.

3.2 Groundwater

As a result of the environmental assessments performed at this site, a total of 25 monitoring wells have been installed and sampled at this site to characterize groundwater quality and provide geologic information.

The results of the groundwater monitoring indicate the existence of contaminants in the northwest area of the site. Contamination is primarily TCA and TCE. The extent of the contamination is in a westerly direction and extends approximately 300 feet from the property boundary. The farthest off-site wells along Bennion Road (MW OF-2 and MW OF-1) did not reveal any contamination. Three off-site private wells were sampled in the previous work and did not detect any contamination.

Hydraulic testing by of certain wells during the latest supplemental investigation found the average groundwater flow velocity to range from 26 - 144 feet per year which is above the range determined in the previous RI activities (9-16 feet per year). Hydraulic gradient analysis confirms earlier work that a downward vertical gradient into the underlying gray till exists.

Deep well contamination is noted in DW-5 (maximum 3400 ppb VOCs) which is screened in the gray sandy silt located 54 feet below ground surface. This well is located downgradient of the source area. It is noted that another deep well - DW-A - is also screened in the same zone but reveals low level contamination (maximum 220 ppb VOCs) even though it is adjacent to MW-A which has shown some of the highest VOC values on the site (maximum 26,000 ppb VOCs). This data possibly reflects the changes in vertical hydraulic gradients present in these locations, changes in site stratigraphy and/or the location relative to the downgradient plume of contamination. The data is important in that remediation of groundwater other than the shallow aquifer system will be required.

4.0 SUMMARY OF THE FEASIBILITY STUDY

The FS completed earlier by Dames & Moore (dated May 1993) is the basis for selecting a remedy for this site with the following exceptions:

4.1 *Groundwater*

The RI has shown that area residents are not impacted by the groundwater contamination at this site. Remediation is required, however, to be protective in the long term of both human health and the environment. The Remedial Action Objective (RAO) for groundwater will be the Standards, Criteria and Guidelines (SCGs) as indicated by NYSDEC. These include 10NYCRR Subpart 5-1 as denoted in Table 2.

Alternatives GW1(no action) and GW2 (Institutional controls) require no change. The alternatives GW3 (Recovery wells, air stripping), GW4 (recovery wells, carbon adsorption), GW5 (collection trench, air stripping) and GW6 (collection trench, carbon adsorption) are considered by the Department to be the same remedy with only the treatment technology and collection technique being changed. Therefore, the Department views only one remedy for groundwater to be evaluated, that is the collection of groundwater and treatment to meet discharge standards as set forth in regulation. The variation of treatment schemes (carbon adsorption versus air stripping), and collection techniques (trench versus wells) will be considered in the design of the remedial action program. The data indicates the groundwater contamination plume has not migrated far from the site and a localized pumping system will be able to eliminate any further migration of contaminants.

During the design phase, consideration will be given to diverting upgradient groundwater flow from contacting the contaminated zones. This is typically done via a barrier wall or simply a diversion drain system located upgradient of the source area. The flat topography where the facility is sited promotes ponding and poor drainage. Consideration shall also be given to regrading areas of the site or paving areas to inhibit percolation of rainwater which only adds to the groundwater volume needing treatment.

Routine monitoring will be required of all monitoring wells as well as off-site private wells to determine efficiency of the remedial program.

Costs associated with the groundwater operable unit are detailed in the Dames & Moore FS. Detailed evaluation in accordance with CERCLA and DEC guidance is provided in the Dames & Moore FS.

4.2 *Soils*

The previous FS was deficient in not addressing the source area located under the building as defined by the earlier soil gas survey and data from the earlier Law Environmental work conducted in 1990. The proposed remedy will require further definition of the source area and sizing an appropriate remedial system. Further soil boring sampling will be required and will be considered as part of the design of the soil remediation system. The goal of remediation will be to remediate soils so they will no longer pose a continuing source of contamination to the groundwater (i.e. contaminant concentrations in groundwater must be at or below groundwater SCGs). NYSDEC TAGM 94-4046 contains goals for soils and is outlined in Table 2.

Specific soil treatment alternatives are as follows:

4.2.1 - *Soil Vacuum Extraction*

This technique extracts volatile organic vapors from contaminated soils. This process can be done in-situ. A typical installation consists of a series of injection wells and extraction wells which draw a vacuum on the soils with the injection wells providing needed makeup air flow. The flow of air through the soils allows the volatile organic compounds to be volatilized into the air stream which is drawn off and treated before being discharged into the atmosphere or re-injected into the ground. This technique has a proven track record and can be installed under existing floors of the building where the majority of the source area is suspected to be.

A pilot scale treatability study may be required as part of the design study before full scale units are put into place. Based upon results from a soil boring program, the soil vacuum extraction (SVE) system would be placed in areas exceeding the clean-up objectives noted in Table 2. Extraction wells would be placed in this area and connected to a vacuum manifold which is in turn connected to a high vacuum pump. The extracted vapors would be passed through a treatment system to remove contaminants from the gas stream. An air discharge permit would be required for the operation of this system. The typical SVE system operates for about a two year period to obtain required soil cleanup goals.

Overall Protection of Human Health and the Environment

The Risk Assessment indicates the subsurface contamination poses no threat to human health due to lack of receptors. However, soil contamination can lead to continuing contamination of groundwater resources. The SVE would remove the contaminants and hence be protective of the environment.

Long-Term Effectiveness

This alternative would be effective in the long term since it will remove VOCs from the soil in a permanent fashion. Residual contamination will not result in continued impacts on the groundwater quality.

Short-Term Effectiveness

There would be no short term impacts since vapors would be treated before being discharged.

Compliance with SCGs

The SCG driving the cleanup is the groundwater standards or guidance values. Soil cleanup levels are based upon protecting these values. The soil and groundwater goals are noted in Table 2. Action specific SCGs include the permit limits imposed by the Clean Air Act and the Clean Water Act and associated New York State regulations.

Reduction of Toxicity, Mobility, or Volume Through Treatment

Treatment is a principal component of this alternative. SVE vapors will be adsorbed by carbon and eventually destroyed via regeneration or the vapors would be treated and destroyed through a catalytic oxidation system.

Implementability

SVE is readily implementable and has been used at many sites with success. Complicating issues here include the possibility of tight soils thereby requiring higher vacuums and additional extraction wells. Installation of soil vents and the installation of an impermeable barrier on the surface may also be required.

Cost

The cost of using SVE can be expected to run for under $100 per cubic yard of soil. This technique is cost effective as compared to other alternatives for soil. Detailed cost estimates are contained in Table 3.

4.2.2 - *Low Temperature Thermal Desorption*

This technique uses heat to vaporize volatile compounds in the soil which is then captured and treated before being discharged int the atmosphere. This technique requires excavation of soils and the construction of the thermal desorption unit on-site. This technique is not feasible when smaller amounts of soil are being processed.

Overall Protection of Human Health and the Environment

The Risk Assessment indicates the subsurface contamination poses no threat to human health due to lack of receptors. However, soil contamination can lead to continuing contamination of groundwater resources. Low Temperature Thermal Desorption (LTDD) would remove the contaminants and hence be protective of the environment.

Long - Term Effectiveness

This alternative would be effective in the long term since it will remove VOCs from the soil in a permanent fashion. Residual contamination will not result in continued impacts on the groundwater quality. Difficulty in removing the existing building may hamper efforts to remove all contaminated material around foundations etc.

Short-Term Effectiveness

There would be short term impacts due to excavation and potential releases to the ambient air.

Compliance with SCGs

The SCG driving the cleanup is the groundwater standards or guidance values. Soil cleanup levels are based upon protecting these values. The soil and groundwater goals are noted in Table xxx. Action specific SCGs include the permit limits imposed by the Clean Air Act and the Clean Water Act and associated New York State regulations. As a treatability study has not been conducted on this site, the true extent of treatmment is unknown. However, vendors of this technology state that greater than 99.9% removal of VOCs is expected. If residual VOC contamiantion were to exist, the presence of VOCs in de minimus concentrations would require the DEC to allow using the soil under a Corrective Action Management Unit concept which allows the soil to be place back in the area from which it was taken after being treated. This CAMU consideration would avoid labelling the soils as hazardous waste under the Land Disposal Restrictions and thereby disallowing on-site usage of the soil.

The potential for air emissions would arise from two operations; the excavation of soils and the treatment of soils. No specific permits would be required for excavation but guidance on evaluating air emissions would be provided using the "Air/Superfund National Technical Guidance Study Series" (EPA-450/1-89-003). Operations would not be expected to generate significant air emissions. The LTTD unit would require an air discharge permit.

Reduction of Toxicity, Mobility, or Volume Through Treatment

Treatment is a principal component of this alternative. SVE vapors will be adsorbed by carbon and eventually destroyed via regeneration or the vapors would be treated and destroyed through a catalytic oxidation system.

Implementability

Difficulties in anchoring sheet piling needed to excavate soils near building foundations is expected. There are several LTTD units are commercially available which would not be an obstacle itself.

Cost

The cost of using LTTD can be expected to run overr $500 per cubic yard of soil. This technique is not cost effective on smaller soil volumes and this site is not expected to generate volumes large enough to justify the costs associated with this technique. An estimated cost of $2.6 million is detailed in Table 4.

4.2.3 - *Excavation/Off-Site Disposal*

This alternative involves the removal of any highly contaminated soil as a means of source removal to facilitate remediation. From a technical perspective, a large portion of the contaminated area is suspected to be under the facility building and are relatively inaccessible. The excavated soils would have to be incinerated on-site via a portable incinerator or disposed off-site at a permitted RCRA facility. Depending on the concentration of contamination found, incineration may have to be considered rather than land disposal.

Overall Protection of Human Health and the Environment

The Risk Assessment indicates the subsurface contamination poses no threat to human health due to lack of receptors. However, soil contamination can lead to continuing contamination of groundwater resources. Excavation would remove the contaminants and hence be protective of the environment.

Long - Term Effectiveness

This alternative would be effective in the long term since it will remove VOCs from the soil in a permanent fashion. Residual contamination will not result in continued impacts on the groundwater quality. Difficulty in removing the existing building may hamper efforts to remove all contaminated material around foundations etc.

Short-Term Effectiveness

There would be short term impacts due to excavation and potential releases to the ambient air.

Compliance with SCGs

The SCG driving the cleanup is the groundwater standards or guidance values. Soil cleanup levels are based upon protecting these values. The soil and groundwater goals are noted in Table 2.

The potential for air emissions would arise from the excavation of soils. No specific permits would be required for excavation but guidance on evaluating air emissions would be provided using the "Air/Superfund National Technical Guidance Study Series" (EPA-450/1-89-003). Operations would not be expected to generate significant air emissions.

Reduction of Toxicity, Mobility, or Volume Through Treatment

This alternative would result in the reduction in the toxicity and mobility of the contaminants of soils within the source areas through off-site treatment techniques. It is likely that highly contaminated soils would require incineration in accordance with RCRA regulations.

Implementability

Difficulties in anchoring sheet piling needed to excavate soils near building foundations is expected. Removal of the building would be necessary in areas resulting in increases in costs.

Cost

The cost of excavation can be expected to run over $500 per cubic yard of soil. Relative to other available alternatives this option does not compare favorably. Table 5 indicates the estimated cost of this alternative to be $2.8 million.

4.2.4 - *No Action*

This alternative would allow the contaminated soil to stay in place. This alternative is considered as required by the National Contingency Plan. This alternative is used as a baseline to compare other alternatives. This alternative is considered unacceptable due to the soil being left in place and its potential to act as a continuing source of contamination to the groundwater.

5.0 - SELECTION OF THE PREFERRED ALTERNATIVE

Based upon comparing the alternatives outlined above and further documented in the Dames & Moore Feasibility Study, the following remedial alternative is selected:

Groundwater

Collection of groundwater utilizing a collection trench, recovery wells or a combination of both, is suggested to prevent further migration of contamination and prevent impacts to private water supplies. The groundwater will be treated prior to disposal to the surface water and will meet required treatment standards applicable under the NYSDEC's State Pollutant Discharge Elimination System. Details of this alternative can be found in the Dames & Moore FS report. This alternative will also include monitoring the groundwater and properly decommissioning West Interior Production well which was found to be a potential source of migration for the contaminants to the lower aquifer system.

Soil

After comparing the various alternatives for soil treatment, including no action, the preferred remedy consists of performing a Soil Vacuum Extraction (SVE) pilot study to determine the effectiveness of this technology on the site. This study, coupled with a soil boring program designed to determine areas requiring remediation i.e. above Remedial Action Objectives, will be the basis for the design of a full-scale SVE system.

Surface Water

Monitoring of the surface water will be required as part of the discharge monitoring requirements of the groundwater treatment system. This monitoring will also assess the effectiveness of the groundwater recovery system to eliminate the contaminated seeps which are currently impacting the receiving stream.

Closure of Underground Storage Tank

The underground storage tank identified in the RI will be properly closed in accordance with NYSDEC regulations. This closure will include assessing the surrounding soils for contamination and remediation if necessary.

In summary, the activities performed by NYSDEC and its consultant - URS - have confirmed and elaborated upon earlier data provided by Dames and Moore. The groundwater contamination plume was defined and information was gathered to prepare a Proposed Remedial Action Plan for this site. The appendices contain the raw data, well logs, field notes and URS reports upon which this summary document was based.

6.0 References

"Draft Feasibility Study, Site No. 961008, Robeson Industries Corporation, Castile, New York", Dames & Moore, May 1993

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"Supplemental Investigation Workplan, Robeson Industries Corporation, Site No. 961008", Dames & Moore, Letter dated March 3, 1993

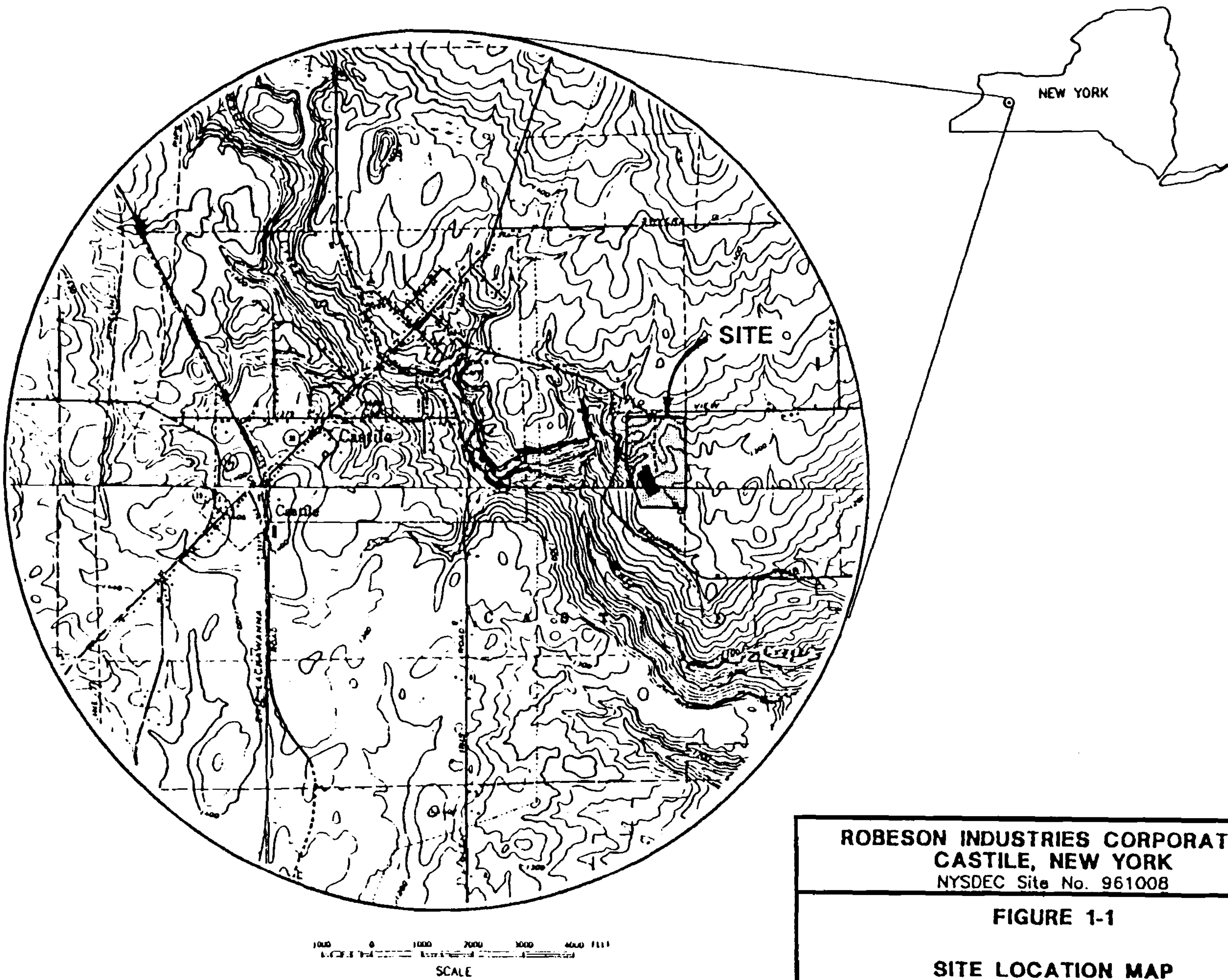
"Phase I Environmental Assessment Report, Robeson Industries Corporation, Castile, New York" Law Environmental, January 1991

"IIWA Robeson Industries, Inc. (Site #961008), Remedial Investigation/Feasibility Study Supplemental Investigation", URS Consultants, Inc. Letter dated January 28, 1994

"IIWA Robeson Industries, Inc. (Site #961008), Supplemental RI/FS Work", URS Consultants, Inc. Letter dated January 18, 1994

"NYSDEC Standby Contract; W.A. D002340-25, IIWA-Robeson Industries Corporation; Site No.961008, Revisions of Additional Work", URS Consultants, Inc. Letter dated February 9, 1994

"NYS Standby Contract; W.A. D002340-25, IIWA Robeson Industries, Inc. (961008), Investigation Data and Information", URS Consultants, Inc. Letter dated December 1, 1993.



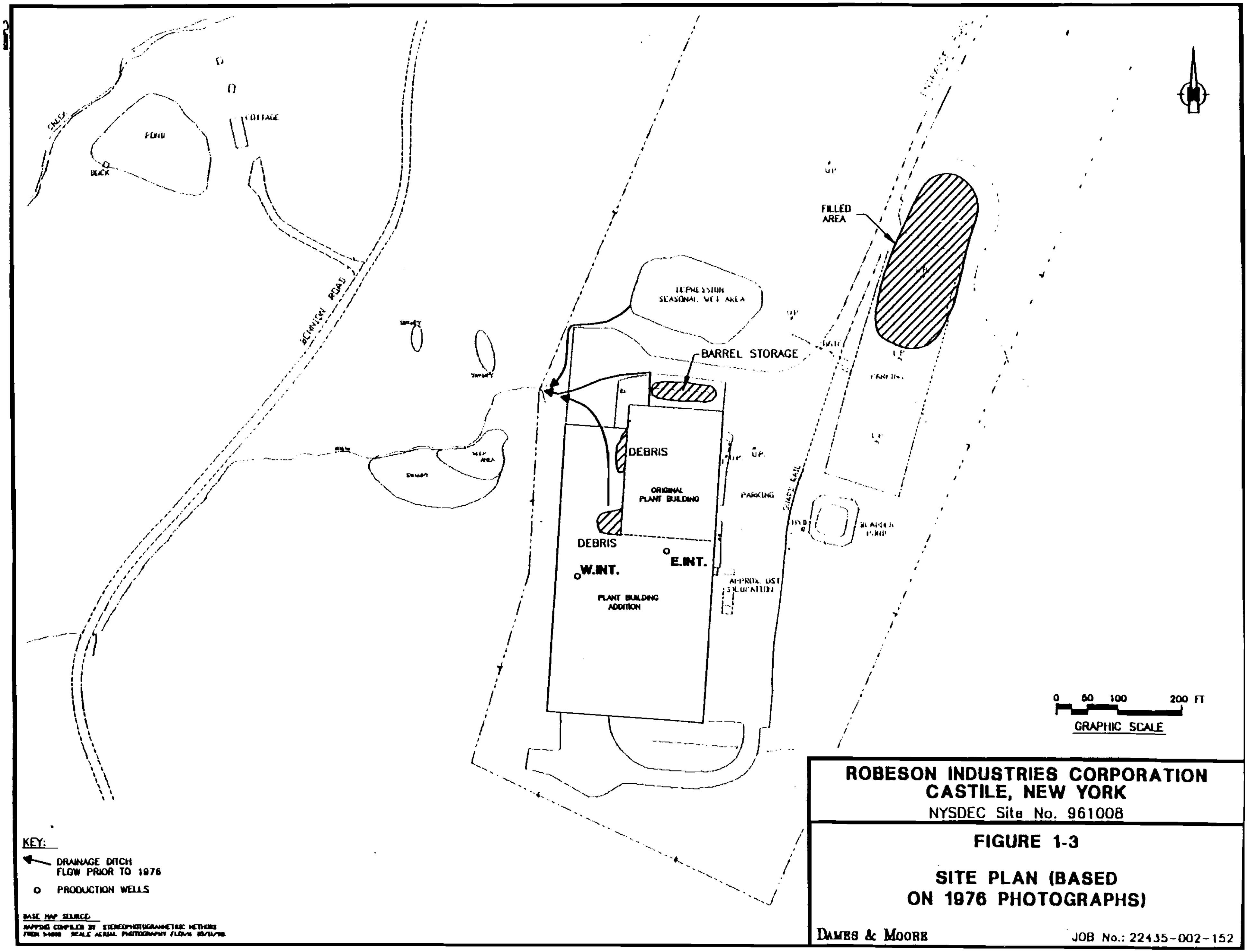
ROBESON INDUSTRIES CORPORATION
CASTILE, NEW YORK
NYSDEC Site No. 961008

FIGURE 1-1

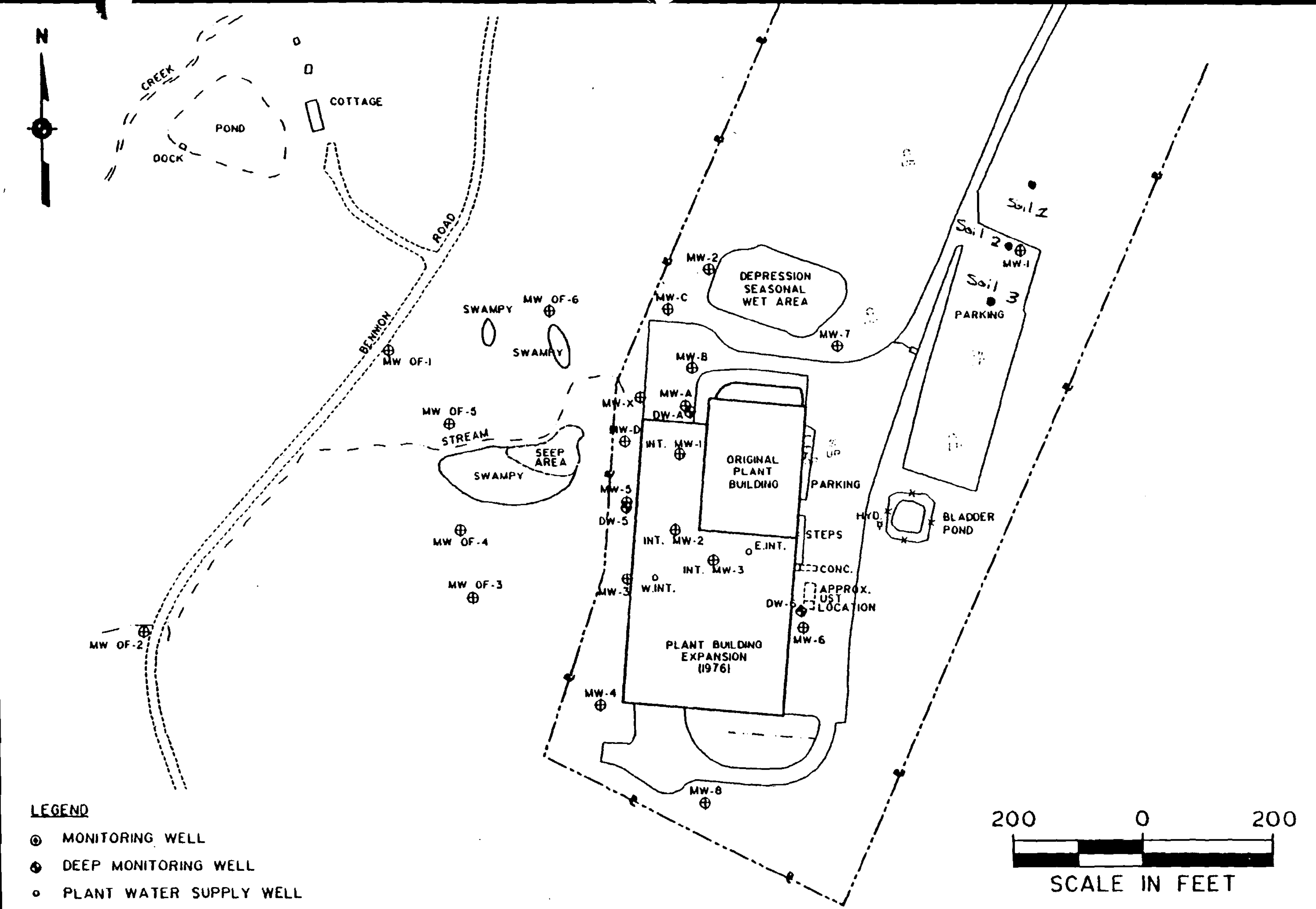
SITE LOCATION MAP

DAMES & MOORE

JOB No.: 22436-002-152


POND
COTTAGE
DOCK
CREEK
BARREL STORAGE
FILLED AREA
DEBRIS
ORIGINAL PLANT BUILDING
DEBRIS
W.INT.
E.INT.
PLANT BUILDING ADDITION
PARKING
0 50 100 200 FT
GRAPHIC SCALE
KEY:
DRAINAGE DITCH FLOW PRIOR TO 1976
o PRODUCTION WELLS
ROBESON INDUSTRIES CORPORATION
CASTILE, NEW YORK
NYSDEC Site No. 961008
FIGURE 1-3
SITE PLAN (BASED ON 1976 PHOTOGRAPHS)
DAMES & MOORE
JOB No.: 22435-002-152

AC-5505 \35243.06\ 1:200 13/94-2-RAL



LEGEND

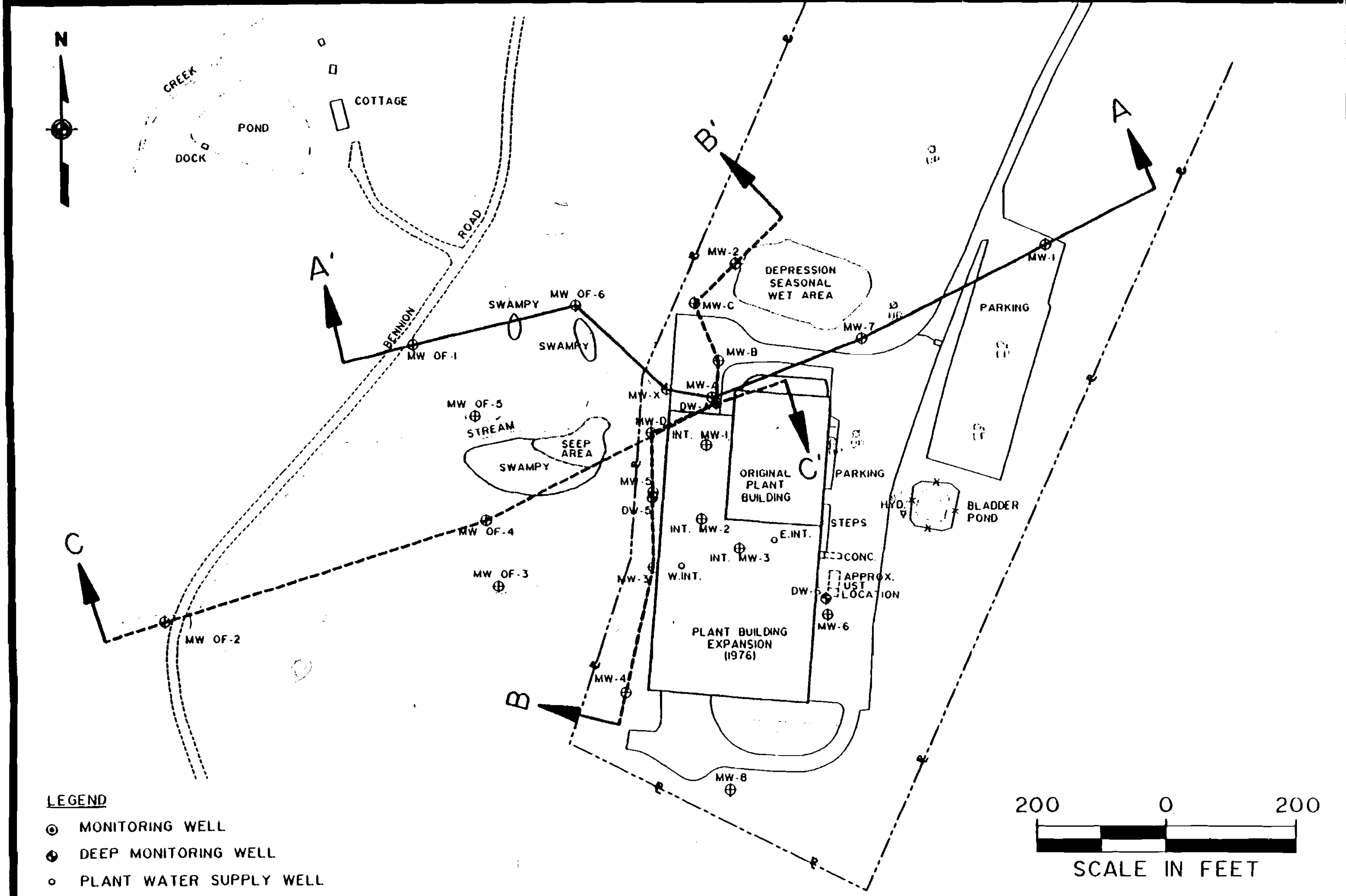
- MONITORING WELL
- DEEP MONITORING WELL
- PLANT WATER SUPPLY WELL

URS CONSULTANTS, INC.

REMEDIAL INVESTIGATION MONITORING WELL LOCATIONS

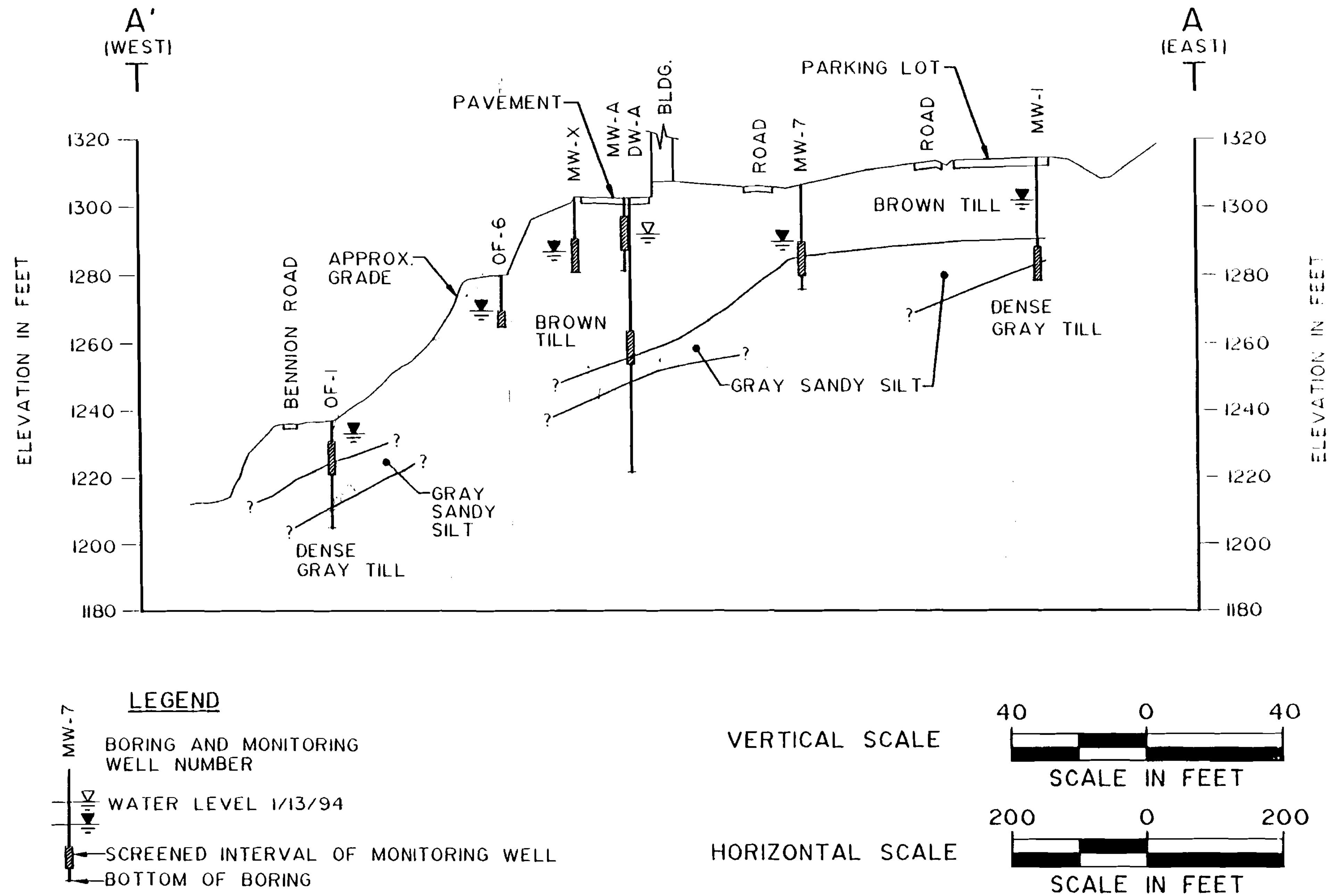
FIGURE 2-5

AC-5509 \35243.06\ 1=20 2/7/94-3-RAL



URS CONSULTANTS, INC.	ROBESON INDUSTRIAL CORPORATION CASTILE, NEW YORK NYSDEC SITE No. 961008	SITE PLAN SHOWING CROSS SECTIONS	FIGURE 3-1

AC-5514 \35243.06\ 1-1 2/7/94-4-RAL



URS CONSULTANTS, INC.

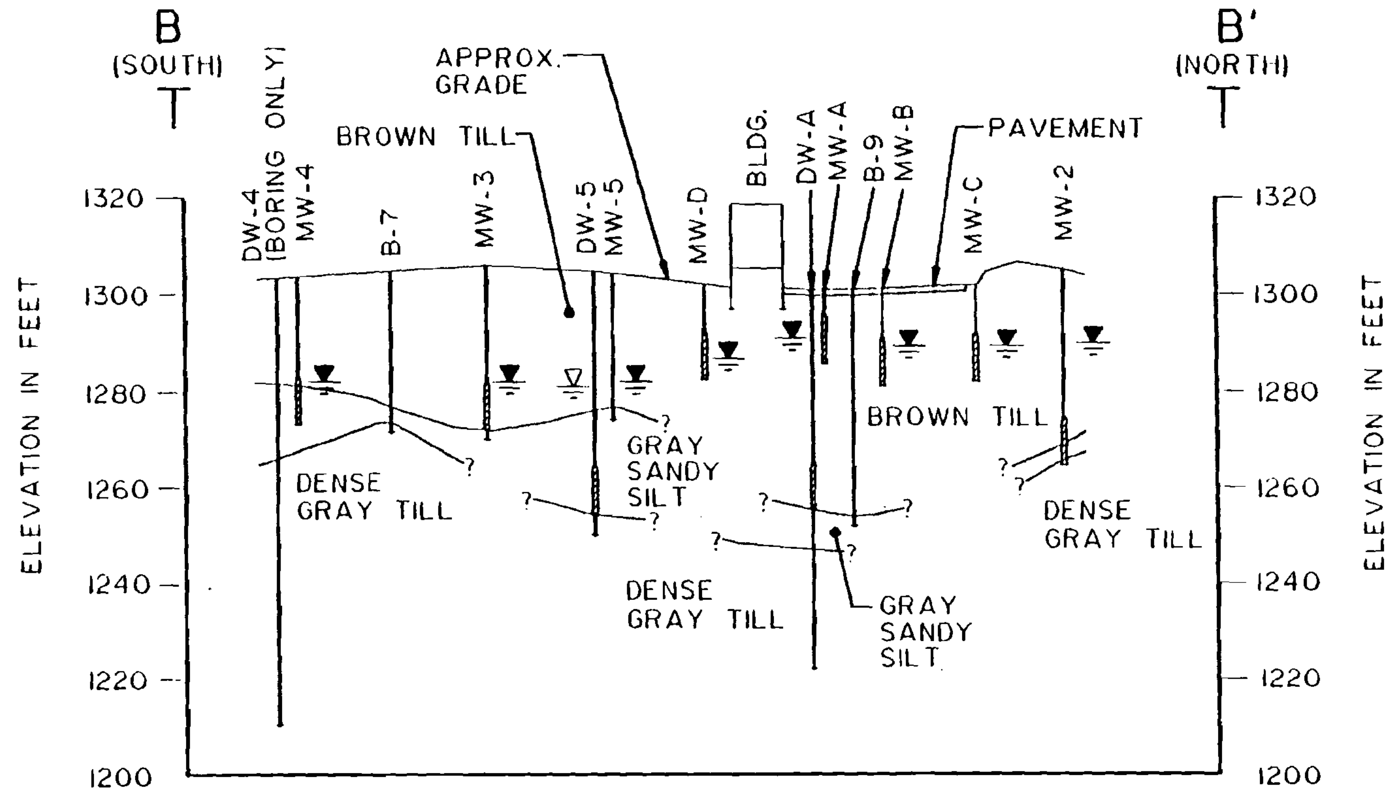
ROBESON INDUSTRIAL CORPORATION
CASTILE, NEW YORK
NYSDEC SITE No. 961008

CROSS SECTION A-A' (EAST-WEST)

FIGURE 3-2

AC-5558

\35243.06\ 1:1 2/7/94-4-RAI



LEGEND

MW-5 BORING AND MONITORING WELL NUMBER

WATER LEVEL 1/13/94

SCREENED INTERVAL OF MONITORING WELL

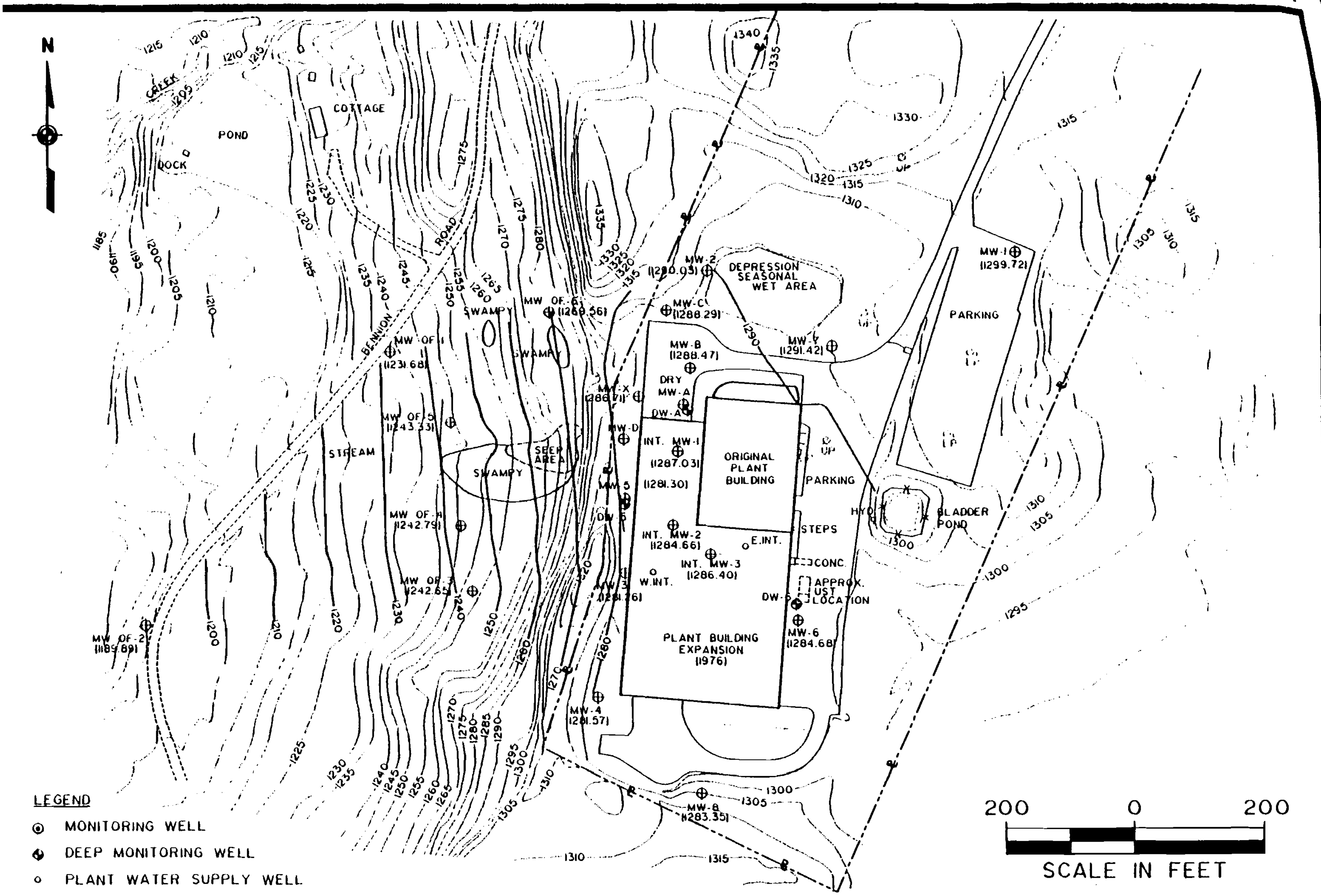
BOTTOM OF BORING

VERTICAL SCALE: 40 0 40 SCALE IN FEET

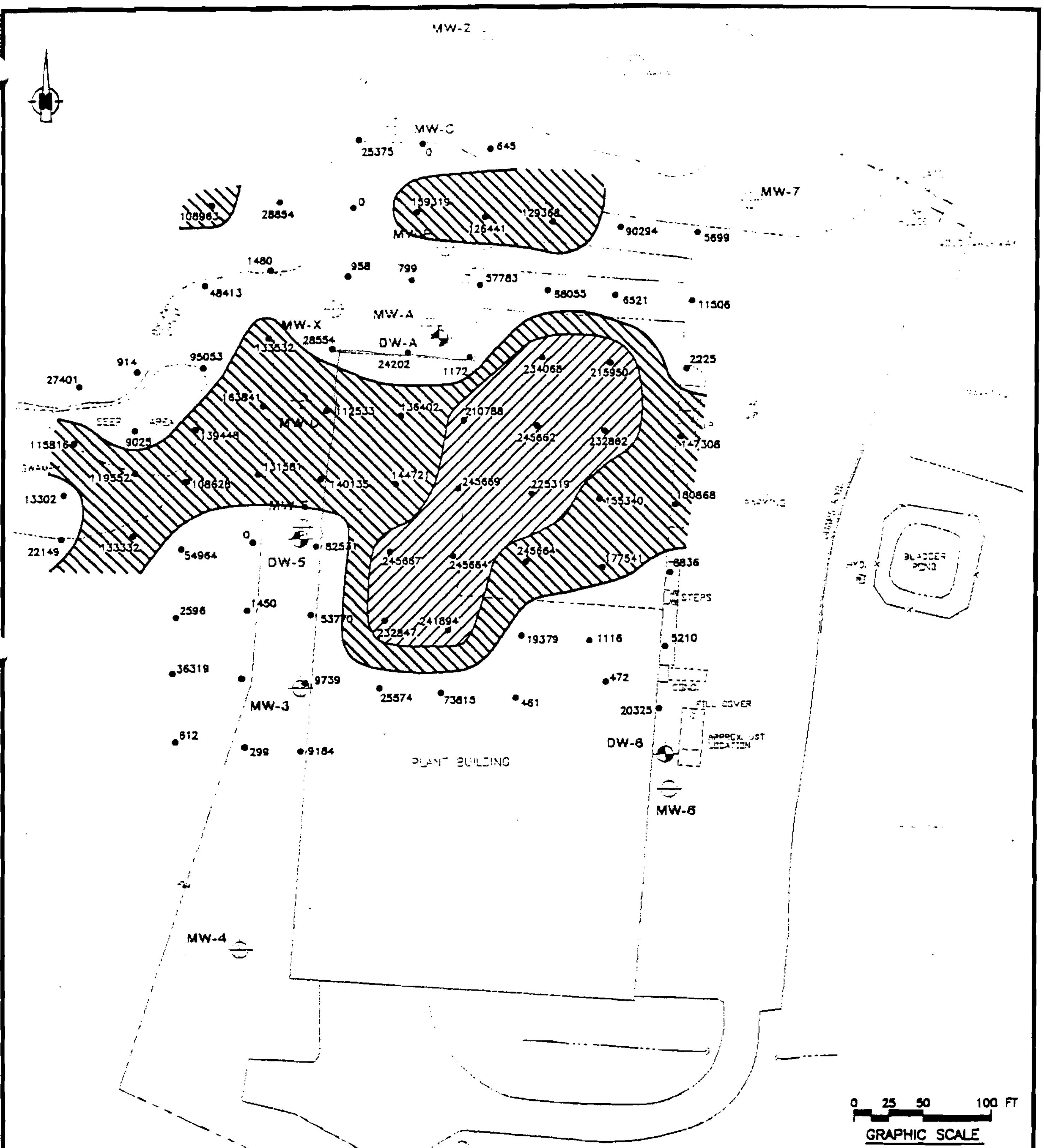
HORIZONTAL SCALE: 200 0 200 SCALE IN FEET

URS CONSULTANTS, INC.	ROBESON INDUSTRIAL CORPORATION CASTILE, NEW YORK NYSDEC SITE No. 961008	**CROSS SECTION B-B' SOUTH-NORTH)**	**FIGURE 3-3**

AC-5564 \35243.06\ 1=200 2/7/94



URS CONSULTANTS, INC.	ROBESON INDUSTRIAL CORPORATION CASTILE, NEW YORK NYSDEC SITE No. 961008	GROUNDWATER CONTOUR MAP 1/13/94	FIGURE 3-4



KEY:

- • PETREX SAMPLER LOCATION
- MONITORING WELL LOCATION
- ION COUNTS ≥ 200,000
- ION COUNTS 100,000 – 199,999

ROBESON INDUSTRIES CORPORATION
CASTILE, NEW YORK
NYSDEC Site No. 961008

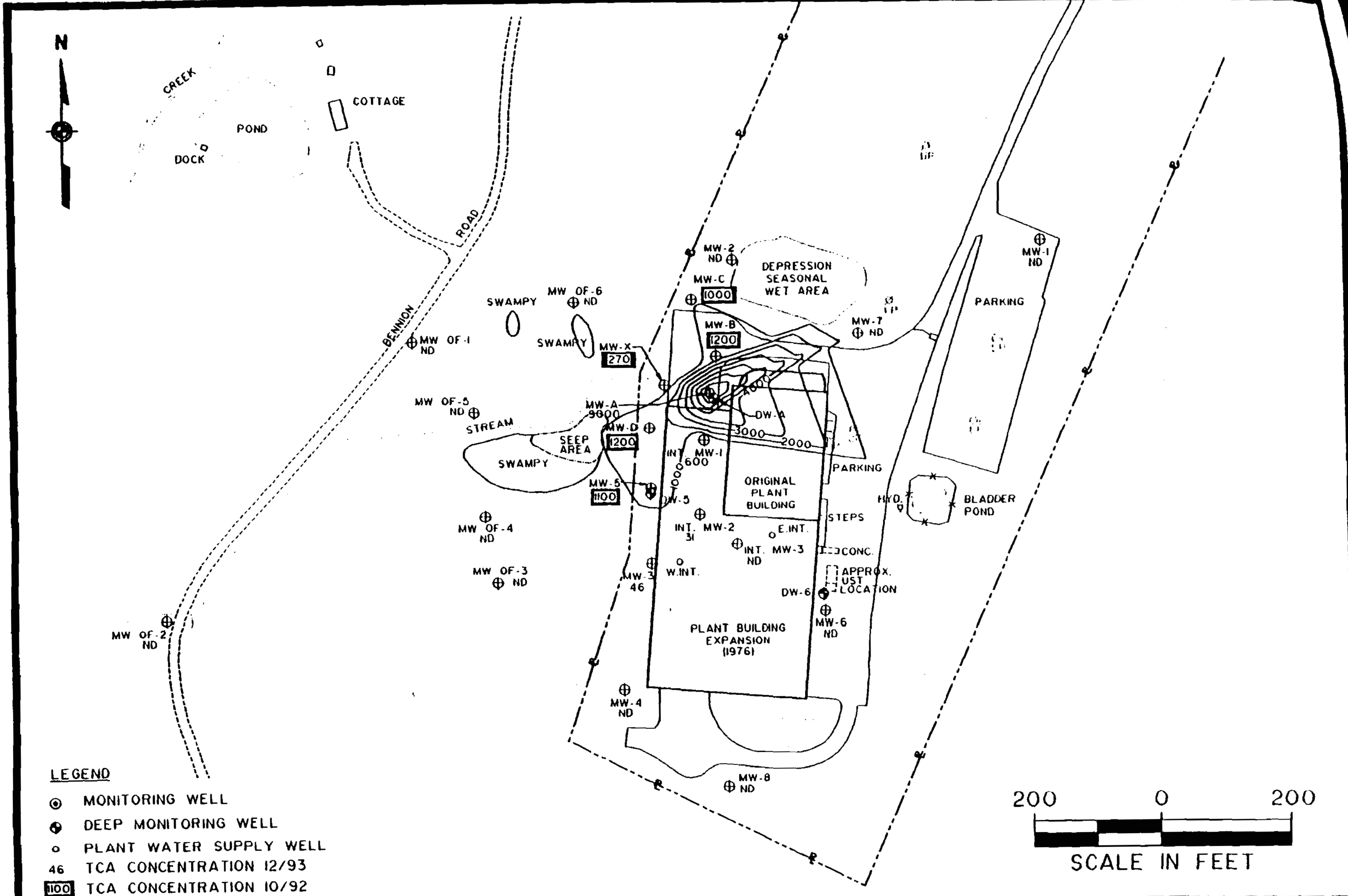
FIGURE 4-2

RELATIVE RESPONSE
TRICHLOROETHENE (TCE)

DAMES & MOORE JOB No.: 22436-002-152

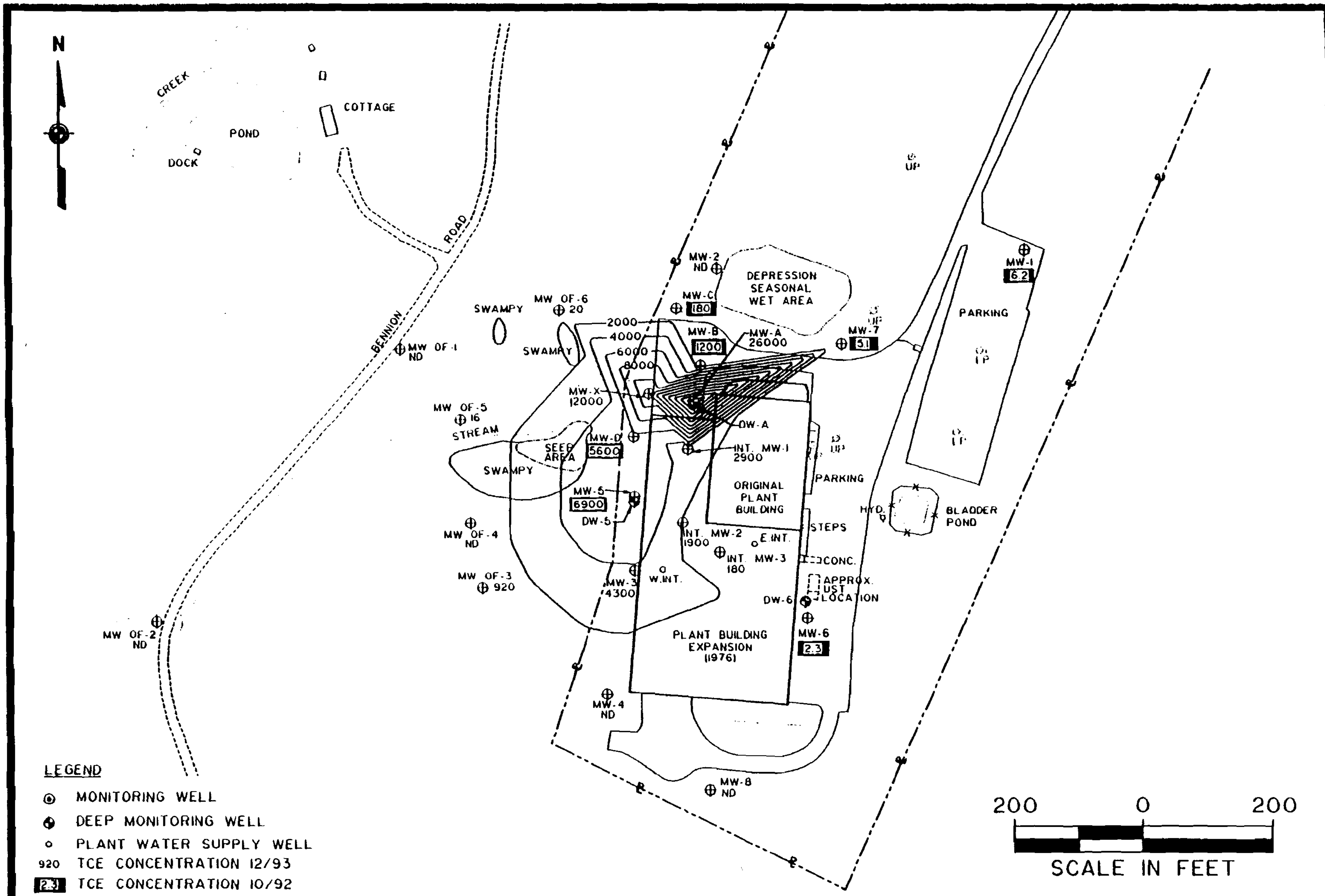
AC-5512

\35243.06\ 1:200 2/7/94



URS CONSULTANTS, INC.	ROBESON INDUSTRIAL CORPORATION CASTILE, NEW YORK NYSDEC SITE No. 961008	TCA CONCENTRATIONS IN GROUNDWATER (μg/L)	FIGURE 4-6

AC-5510 \35243.06\ 1:200 2/7/94-2-RAL



URS CONSULTANTS, INC.	ROBESON INDUSTRIAL CORPORATION CASTILE, NEW YORK NYSDEC SITE No. 961008	TCE CONCENTRATIONS IN GROUNDWATER (μg/L)	FIGURE 4-7

ROBESON INDUSTRIES SITE NO. 961008
RESULTS OF GROUNDWATER ANALYSIS 1992-1994
TCL VOLATILE ORGANIC COMPOUNDS (VOCs)
ALL VALUES ug/l (PPB)

Parameter	Groundwater SCG Value (ug/l)	Source	Int. 3 11/5/93	Int. 2 11/5/93	OF-6 11/5/93	OF-6 1/14/94	OF-5 11/5/93	OF-5 1/14/94
Vinyl Chloride	2	A						
Methylene Chloride	5	A						
Acetone	50	C			1700E		1200E	13
1,1-Dichloroethene	5	A		.8J				
1,1-Dichloroethane	5	A		lJ				
1,2-Dichloroethene (total)	50	B		20	.9J		.7J	
Chloroform	7	A		1J				
l,2-Dichloroethane	5	A						
2-Butanone (or MEK)	50	C						
1,1,1-Trichloroethane	5	A		50	5J	5J	4J	3J
Carbon Tetrachloride	5	A						
Trichloroethene	5	A	180	1100E	26	16	26	17
1,1,2-Trichloroethene	5	A		.6J				
Benzene	0.7	A						
Tetrachloroethene	5	A		.2J	2J	1J		
Toluene	5	A		.9J	.5J		0.3J	
Ethylbenzene	5	A						
Xylene (total)	5	A		.7J	.6J			
Total Volatiles			180	1175.2	1735	22	1231	33

45 - SHADED CONCENTRATION EXECEEDING NY STATE STANDARDS, CRITERIA & GUIDANCE VALUES
TCL - TARGET COMPOUND LIST
A - NEW YORK STATE DEC WATER QUALITY STANDARDS AND GUIDANCE VALUES, NOVEMBER 1991
B - CHAPTER I, NEW YORK SANITARY CODE, SUBPART 5-1, PRINCIPLE ORGANIC CONTAMINANT
C - CHAPTER I, NEW YORK SANITARYCODE, SUBPART 5-1, UNSPECIFIED ORGANIC CONTAMINANT

ROBESON INDUSTRIES SITE NO. 961008
RESULTS OF GROUNDWATER ANALYSIS 1992-1994
TCL VOLATILE ORGANICS COMPOUNDS (VOCS)
ALL VALUES IN ug/l (PPB)

Parameter	Groundwater SCG Value (ug/l)	Source	MW-1 10/13/92	MW-1 10/29/93	MW-2 10/16/92	MW-2 11/2/93	MW-3 10/15/92	MW-3 11/2/93
Vinyl Chloride	2	A						
Methylene Chloride	5	A						
Acetone	50	C						
1,1-Dichloroethene	5	A						11
1,1-Dichloroethane	5	A						60
1,2-Dichloroethene (total)	5	B						20
Chloroform	7	A						
l,2-Dichloroethane	5	A						
2-Butanone (or MEK)	50	C						
1,1,1-Trichloroethane	5	A				4J	42J	58
Carbon Tetrachloride	5	A						
Trichloroethene	5	A	6.2				3100	1800E
1,1,2-Trichloroethene	5	A						0.9J
Benzene	0.7	A						
Tetrachloroethene	5	A						
Toluene	5	A						0.8J
Ethylbenzene	5	A						
Xylene (total)	5	A						
Total Volatiles			6.2	0	0	4	3142	1950.7

45 - SHADED CONCENTRATION EXECEEDING NY STATE STANDARDS, CRITERIA & GUIDANCE VALUES
TCL - TARGET COMPOUND LIST
A - NEW YORK STATE DEC WATER QUALITY STANDARDS AND GUIDANCE VALUES, NOVEMBER 1991
B - CHAPTER I, NEW YORK SANITARY CODE, SUBPART 5-1, PRINCIPLE ORGANIC CONTAMINANT
C - CHAPTER I, NEW YORK SANITARYCODE, SUBPART 5-1, UNSPECIFIED ORGANIC CONTAMINANT

ROBESON INDUSTRIES SITE NO. 961008
RESULTS OF GROUNDWATER ANALYSIS 1992-1994
TCL VOLATILE ORGANIC COMPOUNDS (VOCs)
ALL VALUES ug/l (PPB)

Parameter	Groundwater SCG Value (ug/l)	Source	MW-4 10/14/92	MW-4 11/5/93	MW-5 10/13/92	MW-5 10/29/93	DW-5 (Deep) 10/14/92	DW-5 (Deep) 10/29/93
Vinyl Chloride	2	A						1J
Methylene Chloride	5	A						7J
Acetone	50	C						
1,1-Dichloroethene	5	A				79	110	240E
1,1-Dichloroethane	5	A				25		250E
1,2-Dichloroethene Total)	50	B				47		67
Chloroform	7	A						
l,2-Dichloroethane	5	A						9J
2-Butanone (or MEK)	50	C						
1,1,1-Trichloroethane	5	A			1100	340E	170	400E
Carbon Tetrachloride	5	A						
Trichloroethene	5	A		.3J	6900	2300E	3400	2200E
1,1,2-Trichloroethene	5	A						5J
Benzene	0.7	A						
Tetrachloroethene	5	A						
Toluene	5	A						
Ethylbenzene	5	A						
Xylene (total)	5	A						
Total Volatiles			0	.3	8000	2791	3680	3179

45 - SHADED CONCENTRATION EXECEEDING NY STATE STANDARDS, CRITERIA & GUIDANCE VALUES
TCL - TARGET COMPOUND LIST
A - NEW YORK STATE DEC WATER QUALITY STANDARDS AND GUIDANCE VALUES, NOVEMBER 1991
B - CHAPTER I, NEW YORK SANITARY CODE, SUBPART 5-1, PRINCIPLE ORGANIC CONTAMINANT
C - CHAPTER I, NEW YORK SANITARYCODE, SUBPART 5-1, UNSPECIFIED ORGANIC CONTAMINANT

ROBESON INDUSTRIES SITE NO. 961008
RESULTS OF GROUNDWATER ANALYSIS 1992-1994
TCL VOLATILE ORGANIC COMPOUNDS (VOCs)
ALL VALUES ug/l (PPB)

Parameter	Groundwater SCG Value (ug/l)	Source	East Prod. Well 1/16/92	West Prod. Well 10/13/92	MW-6 10/15/92	MW-6 11/5/93	DW-6 10/14/92	DW-6 11/5/93
Vinyl Chloride	2	A				1J		
Methylene Chloride	5	A						
Acetone	50	C					19	
1,1-Dichloroethene	5	A				1J		
1,1-Dichloroethane	5	A				2J		
1,2-Dichloroethene (total)	50	B						
Chloroform	7	A						
1,2-Dichloroethane	5	A						
2-Butanone (or MEK)	50	C						
1,1,1-Trichloroethane	5	A						
Carbon Tetrachloride	5	A						
Trichloroethene	5	A		59	2.3	2J	.8J	
1,1,2-Trichloroethene	5	A						
Benzene	0.7	A				2J		
Tetrachloroethene	5	A						
Toluene	5	A	3.3J			3J		
Ethylbenzene	5	A				.4J		
Xylene (total)	5	A				3J		
Total Volatiles			3.3	59	2.3	14.4	19.8	0

45 - SHADED CONCENTRATION EXECEEDING NY STATE STANDARDS, CRITERIA & GUIDANCE VALUES
TCL - TARGET COMPOUND LIST
A - NEW YORK STATE DEC WATER QUALITY STANDARDS AND GUIDANCE VALUES, NOVEMBER 1991
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C - CHAPTER I, NEW YORK SANITARYCODE, SUBPART 5-1, UNSPECIFIED ORGANIC CONTAMINANT

ROBESON INDUSTRIES SITE NO. 961008
RESULTS OF GROUNDWATER ANALYSIS 1992-1994
TCL VOLATILE ORGANIC COMPOUNDS (VOCs)
ALL VALUES ug/l (PPB)

Parameter	Groundwater SCG Value (ug/l)	Source	MW-7 10/15/92	MW-7 10/29/93	MW-8 10/14/92	MW-8 11/5/93	OF-1 10/16/92	OF-2 10/16/92
Vinyl Chloride	2	A						
Methylene Chloride	5	A						
Acetone	50	C						
1,1-Dichloroethene	5	A						
1,1-Dichloroethane	5	A						
1,2-Dichloroethene (total)	5	B		3J				
Chloroform	7	A						
1,2-Dichloroethane	5	A						
2-Butanone (or MEK)	50	C						
1,1,1-Trichloroethane	5	A						
Carbon Tetrachloride	5	A						
Trichloroethene	5	A	5.1	7J				
1,1,2-Trichloroethene	5	A						
Benzene	0.7	A						
Tetrachloroethene	5	A						
Toluene	5	A						
Ethylbenzene	5	A						
Xylene (total)	5	A						
Total Volatiles			5.1	10	0	0	0	0

45 - SHADED CONCENTRATION EXECEEDING NY STATE STANDARDS, CRITERIA & GUIDANCE VALUES
TCL - TARGET COMPOUND LIST
A - NEW YORK STATE DEC WATER QUALITY STANDARDS AND GUIDANCE VALUES, NOVEMBER 1991
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C - CHAPTER I, NEW YORK SANITARYCODE, SUBPART 5-1, UNSPECIFIED ORGANIC CONTAMINANT

ROBESON INDUSTRIES SITE NO. 961008
RESULTS OF GROUNDWATER ANALYSIS 1992-1994
TCL VOLATILE ORGANIC COMPOUNDS (VOCs)
ALL VALUES ug/l (PPB)

Parameter	Groundwater SCG Value (ug/l)	Source	MW-A 10/16/92	MW-A 10/16/92	DW-A 10/14/92	DW-A 11/5/93	MW-B 10/15/92	MW-B 11/2/93
Vinyl Chloride	2	A						
Methylene Chloride	5	A		2J				
Acetone	50	C						
1,1-Dichloroethene	5	A		190		2J	23J	25
1,1-Dichloroethane	5	A		10				4J
1,2-Dichloroethene (total)	50	B		38				10
Chloroform	7	A		2J				
l,2-Dichloroethane	5	A						
2-Butanone (or MEK)	50	C						
1,1,1-Trichloroethane	5	A	830	2800E	63	15	1200	1100E
Carbon Tetrachloride	5	A		2J				
Trichloroethene	5	A	3600	4400E	160	4	1200	930E
1,1,2-Trichloroethene	5	A		4J				
Benzene	0.7	A						
Tetrachloroethene	5	A		8J				1J
Toluene	5	A						
Ethylbenzene	5	A						
Xylene (total)	5	A						
Total Volatiles			4430	7456	223	21	2423	2070

45 - SHADED CONCENTRATION EXECEEDING NY STATE STANDARDS, CRITERIA & GUIDANCE VALUES
TCL - TARGET COMPOUND LIST
A - NEW YORK STATE DEC WATER QUALITY STANDARDS AND GUIDANCE VALUES, NOVEMBER 1991
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C - CHAPTER I, NEW YORK SANITARYCODE, SUBPART 5-1, UNSPECIFIED ORGANIC CONTAMINANT

ROBESON INDUSTRIES SITE NO. 961008
RESULTS OF GROUNDWATER ANALYSIS 1992-1994
TCL VOLATILE ORGANIC COMPOUNDS (VOCs)
ALL VALUES ug/l (PPB)

Parameter	Groundwater SCG Value (ug/l)	Source	MW-C 10/15/92	MW-C 11/2/93	MW-D 10/16/92	MW-D 10/29/93	MW-X 10/15/92	MW-X 11/2/93
Vinyl Chloride	2	A						
Methylene Chloride	5	A						
Acetone	50	C						
1,1-Dichloroethene	5	A				14		5J
1,1-Dichloroethane	5	A				3J		
1,2-Dichloroethene (total)	50	B			130J	73		39
Chloroform	7	A						
l,2-Dichloroethane	5	A						
2-Butanone (or MEK)	50	C	1000	81		430E	270	230E
1,1,1-Trichloroethane	5	A				.8J		
Carbon Tetrachloride	5	A						
Trichloroethene	5	A	180	68	5600	1600E	9200	2900E
1,1,2-Trichloroethene	5	A			1200			
Benzene	0.7	A						
Tetrachloroethene	5	A	76	17		4J		
Toluene	5	A						
Ethylbenzene	5	A						
Xylene (total)	5	A						
Total Volatiles			1256	166	6930	2124.8	9470	3174

45 - SHADED CONCENTRATION EXECEEDING NY STATE STANDARDS, CRITERIA & GUIDANCE VALUES
TCL - TARGET COMPOUND LIST
A - NEW YORK STATE DEC WATER QUALITY STANDARDS AND GUIDANCE VALUES, NOVEMBER 1991
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C - CHAPTER I, NEW YORK SANITARYCODE, SUBPART 5-1, UNSPECIFIED ORGANIC CONTAMINANT

ROBESON INDUSTRIES SITE NO. 961008
RESULTS OF GROUNDWATER ANALYSIS 1992-1994
TCL VOLATILE ORGANIC COMPOUNDS (VOCs)
ALL VALUES ug/l (PPB)

Parameter	Groundwater SCG Value (ug/l)	Source	Int. 1 11/2/93	Soil 1 8-10' BGS 10/28/93 (ug/kg)	Soil 2 2-4' BGS 10/28/93 (ug/kg)	Soil 3 0-2' BGS 10/28/93 (ug/kg)	Pump Test #1 West Prod. Well 10/28/93 0730 hrs.	Pump Test #2 West Prod.Wells 10/28/93 1030 hrs
Vinyl Chloride	2	A						
Methylene Chloride	5	A						
Acetone	50	C		220	210			
1,1-Dichloroethene	5	A	20					
1,1-Dichloroethane	5	A	5J					
1,2-Dichloroethene (total)	50	B	72					
Chloroform	7	A						
1,2-Dichloroethane	5	A						
2-Butanone (or MEK)	50	C		54	37			
1,1,1-Trichloroethane	5	A	660E					
Carbon Tetrachloride	5	A						
Trichloroethene	5	A	1500E				2J	
1,1,2-Trichloroethene	5	A						
Benzene	0.7	A					2J	
Tetrachloroethene	5	A	3J					
Toluene	5	A		4J			9J	2J
Ethylbenzene	5	A		1J			3J	0.8J
Xylene (total)	5	A		2J			14	3J
Total Volatiles			2260	281	247	0	30	13

45 - SHADED CONCENTRATION EXECEEDING NY STATE STANDARDS, CRITERIA & GUIDANCE VALUES
TCL - TARGET COMPOUND LIST
A - NEW YORK STATE DEC WATER QUALITY STANDARDS AND GUIDANCE VALUES, NOVEMBER 1991
B - CHAPTER I, NEW YORK SANITARY CODE, SUBPART 5-1, PRINCIPLE ORGANIC CONTAMINANT
C - CHAPTER I, NEW YORK SANITARYCODE, SUBPART 5-1, UNSPECIFIED ORGANIC CONTAMINANT

ROBESON INDUSTRIES SITE NO. 961008
RESULTS OF GROUNDWATER ANALYSIS 1992-1994
TCL VOLATILE ORGANIC COMPOUNDS (VOCs)
ALL VALUES ug/l (PPB)

Parameter	Groundwater SCG Value (ug/l)	Source	Pump Test #3 West Prod. Well 10/28/93 1335 hrs	Pump Test #4 W. Prod. Well 10/28/93 1635 hrs.				
Vinyl Chloride	2	A						
Methylene Chloride	5	A						
Acetone	50	C						
1,1-Dichloroethene	5	A						
1,1-Dichloroethane	5	A						
1,2-Dichloroethene (total)	50	B						
Chloroform	7	A						
1,2-Dichloroethane	5	A						
2-Butanone (or MEK)	50	C						
1,1,1-Trichloroethane	5	A						
Carbon Tetrachloride	5	A						
Trichloroethene	5	A						
1,1,2-Trichloroethene	5	A						
Benzene	0.7	A						
Tetrachloroethene	5	A						
Toluene	5	A	.9J	.7J				
Ethylbenzene	5	A						
Xylene (total)	5	A	1J	1J				
Total Volatiles			1.9	1.7				

45 - SHADED CONCENTRATION EXECEEDING NY STATE STANDARDS, CRITERIA & GUIDANCE VALUES
TCL - TARGET COMPOUND LIST
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B - CHAPTER I, NEW YORK SANITARY CODE, SUBPART 5-1, PRINCIPLE ORGANIC CONTAMINANT
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ROBESON INDUSTRIES SITE NO. 961008
RESULTS OF GROUNDWATER ANALYSIS 1992-1994
TCL VOLATILE ORGANIC COMPOUNDS (VOCs)
ALL VALUES ug/l (PPB)

Parameter	Groundwater SCG Value (ug/l)	Source	OF-4 11/5/93	OF-4 1/14/94	OF-3 11/5/93	OF-3 1/14/94	OF-2 11/5/93	OF-1 11/5/93
Vinyl Chloride	2	A						
Methylene Chloride	5	A						
Acetone	50	C	10,000E	12	37			
1,1-Dichloroethene	5	A				3J		
1,1-Dichloroethane	5	A	4J		9J	28		
1,2-Dichloroethene (total)	50	B	19		8J	26		
Chloroform	7	A	.7J					
l,2-Dichloroethane	5	A						
2-Butanone (or MEK)	50	C						
1,1,1-Trichloroethane	5	A			3J	10		
Carbon Tetrachloride	5	A						
Trichloroethene	5	A			700E	1500E		
1,1,2-Trichloroethene	5	A						
Benzene	0.7	A						
Tetrachloroethene	5	A						
Toluene	5	A			.5J			
Ethylbenzene	5	A						
Xylene (total)	5	A						
Total Volatiles			10,023.7	12	757.5	1567	0	0

45 - SHADED CONCENTRATION EXECEEDING NY STATE STANDARDS, CRITERIA & GUIDANCE VALUES
TCL - TARGET COMPOUND LIST
A - NEW YORK STATE DEC WATER QUALITY STANDARDS AND GUIDANCE VALUES, NOVEMBER 1991
B - CHAPTER I, NEW YORK SANITARY CODE, SUBPART 5-1, PRINCIPLE ORGANIC CONTAMINANT
C - CHAPTER I, NEW YORK SANITARYCODE, SUBPART 5-1, UNSPECIFIED ORGANIC CONTAMINANT

TABLE 2

CLEANUP GOALS FOR CHEMICALS OF CONCERN
Robeson Site #961008

Chemicals of Concern	Surface Water Cleanup Goals ug/l	Ground Water Cleanup Goals ug/l	Soil Cleanup Goals ug/kg
Trichlorethene	5	5	1000
1,2-Dichloroethene	0.8	5	1000
Vinyl Chloride	2	2	1000
1,1,1-Trichloroethane	0.6	5	1000

The Proposed cleanup goals were developed utilizing the New York State Codes, Rules, and Regulations, Title 6, Chapter X, Parts 700-705 and NYSDEC TAGM #4046.

TABLE 4-1
Preliminary Cost Estimate

Robeson Industries Corporation
Castile, New York

Alternative GW2:
Description-
Institutional Controls

Description	Unit	Qty	Unit Cost	Extended Cost	Subtotal
Capital Costs					
Direct Costs					
Fencing/Access Controls	Ft	1200	$19	$22,500	
					$22,500
Indirect Costs					
Engineering	%	20		$4,500	
Contingency	%	20		$4,500	
					$9,000
Total Capital Costs					$31,500
Annual Operating Costs					
Access Controls	Yr	1	$6,000	$6,000	
Environmental Monitoring	Yr	1	$11,600	$11,600	
Contingency	%	20		$3,520	
Total Annual Operating Costs					$21,120

Present Worth

Annual Discount Rate	Years	Total Present Worth
10%	30	$230,596
7%	30	$293,579
6%	30	$322,213
5%	30	$356,166

TABLE 3

Detailed Costs
Soil Vapor Extraction and Treatment Systems
Robeson Feasibility Study

Components	Unit	Quanity	Unit Costs	Capital Costs	Annual O & M	Net Present Worth (1)
Predesign Pilot Test	L.S.	1	40,000	40,000		40,000
Install Extraction Wells	ea.	8	2,000	16,000		16,000
Install Injection Wells	ea.	4	2,000	8,000		8,000
Underground Piping	L.S.	1	5,000	5,000		5,000
Blowers & Equipment	L.S.	1	35,000	35,000		35,000
Vapor Phase Carbon	L.S.	1	20,000	20,000		20,000
Instrument/Electrical	L.S.	1	10,000	10,000		10,000
Civil/Mechanical	L.S.	1	15,000	15,000		15,000
Engineering	%	20		30,000		30,000
Carbon Replacement	L.S.	1	20,000		20,000	82,000
Maintenance	L.S.	1	6,000		6,000	24,600
Operator Labor	L.S.	1	12,000		12,000	49,200
Total Costs				179,000	38,000	334,800

(1) Net Present Worth is calculated using a 5 percent compound interest factor and an operational life of 5 years.

TABLE 4

Detailed Costs
Thermal Desorption
Robeson Feasibility Study

Component	Unit	Quanity	Unit Cost	Capital Costs	Annual O & M	Net Present Worth (1)
Predesign Pilot Test	L.S.	1	10,000	10,000		10,000
Soil Excavation	Cu. Yd.	5000	13.50	67,500		67,500
Backfill/Tamping	Cu. Yd.	5000	4.00	20,000		20,000
Soil Conditioning	Cu. Yd.	5000	15.00	75,000		75,000
Thermal Desorption	Ton	7500	225.00	1,687,500		1,687,500
Sample/Monitoring	ea.	80	225.00	18,000		18,000
Engineering	%	20		375,000		375,000
Contingency	%	20		375,000		375,000
Total Estimated Cost				2,627,000		2,627,000

TABLE 5

Detailed Costs
Excavation/Off Site Disposal
Robeson Feasibility Study

Component	Unit	Quanity	Unit Cost	Capital Cost	Annual O & M	Net Present Worth
Soil Excavation	Cu. Yd.	5,000	13.50	67,500		67,500
Backfill/Tamping	Cu. Yd.	5,000	4.00	20,000		20,000
Off-Site Disposal	Tons	7,500	250.00	1,875,000		1,875,000
Sampling/Profile	ea.	75	1,000	75,000		75,000
Engineering	%	20		407,500		407,500
Contingency	%	20		407,500		407,500
Total Estimated Cost				2,852,500		2,852,500

TABLE 6

Detailed Costs
Groundwater Collection and Treatment System

ROBESON Feasibility Study

Components (2)	Unit	Quantity	Unit Costs	Capital Costs	Annual O&M	Net Present Worth (1)
Extraction Wells	ft	5	5,770	5,770	-	5,770
Utility Trench	ft	400	21	8,307	-	8,307
Treatment System (3)	LS	1	51,000	51,000	-	51,000
Engineering	%	25	-	22,039	-	22,039
Inspection	%	15	-	13,224	-	13,224
Contingency	%	20	-	17,631	-	17,631
Extraction System	Yr	1	8,388	-	8,388	128,944
Treatment System	Yr	1	5,500	-	5,500	84,548
Environmental Monitoring	Yr	1	11,600	-	1,600	178,321
Contingency	%	20	-	-	5,098	78,369
TOTAL COSTS				$141,052	$30,586	$588,153

(1) -Net Present Worth is calculated using a 5% compound interest factor and an operational life of 30 years.

(2) -For purposes of calculation a collection system using groundwater extraction wells is the basis for study.

(3) -For purposes of calculation an air-stripper system is the basis for study.