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Remedial Design and Start-up Monitoring Plan

Prepared for:

Cherokee Environmental Risk Management, LP
Former Borden Resin Facility
Bainbridge, New York

Prepared by:

Law Engineering and Environmental Services, P.C.
Albany, New York
Law Project No. 50700-8-0985

March 1999

LAW

LAWGIBB Group Member

March 4, 1999

VIA FEDERAL EXPRESS

Mr. Tim DiGiulio, P.E.
Ms. Denise Radtke
New York State Department of Environmental Conservation
Bureau of Hazardous Compliance and Land Management
50 Wolf Road
Albany, NY 12233-7252

Subject: **Remedial Design and Start-up Monitoring Plan**
Former Borden Resin Facility
Bainbridge, NY
LAW Project No. 50700-8-0985

Dear Tim and Denise:

On behalf of Cherokee Environmental Risk Management, L.P. (Cherokee), Law Engineering and Environmental Services, P.C. (LAW) is herein providing the "Remedial Design and Start-up Monitoring Plan" for your review. This plan will not be implemented until approved by NYSDEC.

If you have any questions or comments, please contact Scott Fennell at you earliest convenience.

Sincerely,

Law Engineering and Environmental Services, Inc.

Scott Fennell, P.E.
Senior Engineer
Project Manager

David Share, P.E.
Principal Engineer

C: Ms. Meg Miller, Cherokee

Engineer's Certification

In accordance with Condition IX of Order on Consent Index No. A7-0121-87-09, this Remedial Design has been prepared by an engineer licensed to practice in the State of New York.

3/4/97

Signature: Scott Fennell, P.E., Date Seal

STATE OF NEW YORK SCOTT FENNELL 070348-1 LICENSED PROFESSIONAL ENGINEER

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1.0 Introduction

1.1 Purpose

The purpose of this document is to provide plans for field implementation and/or construction of corrective measures addressing soil and groundwater contamination at the former Borden Resin Facility in Bainbridge, New York. Modifications to these plans may be necessary based upon unanticipated field or other conditions. Significant modifications (e.g., significant schedule changes, waste disposition) will not be made except after consultation with NYSDEC.

1.2 Background

From the 1940s until 1981, Borden, Inc. owned and operated a synthetic resin manufacturing facility in Bainbridge, New York. The facility was deactivated in 1981. In 1990, Borden entered into Order on Consent Index No. A7-0121-87-09 with the New York State Department of Environmental Conservation (NYSDEC) to identify and remediate environmental contamination at the facility. Significant environmental milestones include the following:

- Submission of RCRA Facility Investigation (RFI) Reports – July 1992 and August 1996.
- Implementation of Interim Corrective Measures (ICM) addressing groundwater contamination – June 1996.
- Implementation of ICM addressing soil and sludge contamination – 1981 through 1996.
- Submission of Corrective Measures Study (CMS) Report – February 1997 (Revisions April 1998).
- Submission of Corrective Measures Implementation (CMI) Plan – September 1998.

2.0 Corrective Measures Addressing Contaminated Soils

Soils contaminated with polychlorinated biphenyls (PCBs) have been delineated at four separate areas at the site: PCB Area, Bone Yard, River Lagoon, and Land Application Area Trenches. Additionally, soils contaminated with volatile organic compounds (VOCs) and phenolics have been delineated in the Phenol Recovery Area. The locations of these areas are illustrated on Figure 1.

Contaminated soils are to be remediated by excavation and off-site disposal.

2.1 PCB Soils

2.1.1 Remedial Criteria

Excavation will proceed until remedial criteria are achieved. The PCB-soil remedial criteria for the various contaminated areas are as follows:

- River Lagoon soils will be excavated to one mg/kg or less PCBs.
- Land Application Area Trenches, Bone Yard, and PCB Area will be excavated to 25 mg/kg or less PCBs.

It should be noted that remedial criteria for a given area may be modified to a more restrictive standard if it is later determined that an alternative criteria is more desirable.

2.1.2 Disposal Criteria

For purposes of waste characterization and disposal, PCB-soil concentrations are to be based upon in-situ concentrations to the extent possible. This is because TSCA has an anti-dilution provision.

Soils exhibiting a PCB concentration of 50 mg/kg or more are to disposed of in a hazardous waste landfill. The New York State hazardous waste code for PCB-soil waste is B007. Soils exhibiting a PCB concentration of less that 50 mg/kg are to be disposed of in a non-hazardous landfill.

Any additional PCB analysis, if necessary, is to be reported on a dry weight basis.

2.1.3 Excavation Procedures

If possible, excavation is to be performed when soil moisture is minimized (e.g., mid to late summer, after a dry period). This will minimize the weight (i.e., disposal cost) of soil moisture, and minimize the occurrence of groundwater in the excavations.

Prior to excavation, the following tasks will be completed.

- Hazardous and non-hazardous disposal facilities will be selected and contractually secured (e.g., waste profiles approved), and waste transportation will be arranged.
- Tall grass and other potentially obstructive vegetation will be removed from the areas to be excavated.

- RFI soil borings used to delineate the extent of contamination will be re-located and re-staked based upon prior benchmarks established in the field (see Phase II RFI Report).

The exception to the above is the PCB Area, which is currently an open excavation with groundwater in it. Prior to and concurrent with excavating the PCB Area, groundwater will be pumped from the excavation and treated prior to disposal in accordance with the PCB Water Treatment Plan provided in Appendix B.

For the River Lagoon, Bone Yard, and Trenches, generalized excavation maps depicting the required areas of excavation (i.e., areas above the respective remedial criteria) are provided on Figures 2, 3, 4, and 5. Also depicted on the maps are the depth intervals at each sample location which exhibit hazardous concentrations (>/= 50 mg/kg in red) and non-hazardous concentrations (<50 mg/kg in blue). These maps were developed from tabulated sampling data in the RFI reports. It is necessary to distinguish between in-situ hazardous versus non-hazardous soils due to the anti-dilution provision of the PCB regulations, and the requirement to use in-situ data in lieu of ex-situ data, if possible.

The area to be excavated in the PCB Area is depicted on Figure 6. Based upon sampling of the underlying native silt/clay, it is anticipated that only approximately two feet will have to be removed from the bottom of the existing excavation. An additional consideration of excavating the PCB Area will be the wooden pilings in the bottom of the excavation formerly used to support the chimney stack (now removed). Pilings are spaced as close as 18-inches apart. Since it is assumed that the wooden pilings may have absorbed PCBs within the zone of soil contamination, the pilings will be cut off at the bottom of the final excavation and the waste will be disposed of as hazardous. Requirements for shoring or other excavation safety requirements will be determined in the field.

For the River Lagoon and Bone Yard sample areas, each sample location represents an area approximated by a circle with a radius of 18 feet, a surface area of 1,018 square feet, and a soil volume of 40 cubic yards per foot of depth. Utilizing the hazardous/non-hazardous depth intervals illustrated on the excavation maps, and assuming a soil weight of 1.5 tons/cubic yard, estimated excavation volumes are as follows: 60 ton x $100/ton = $6000

- River Lagoon (to one mg/kg) – 2,200 tons hazardous; 5,800 tons non-hazardous
- Bone Yard (to 25 mg/kg) – 1,500 tons hazardous; 1,500 tons non-hazardous
- PCB Area (to 25 mg/kg) – 200 tons hazardous
- Trenches (to 25 mg/kg) – 50 tons hazardous; 50 tons non-hazardous

Soil excavation is to be performed with a loader, backhoe, excavator or similar equipment and under continuous direction of a professional familiar with the PCB sampling data. (In order to better control excavation depth, a straight-edge plate may be welded over excavator bucket teeth.) For shallow excavations (e.g., < 6 feet), selected marking stakes may be temporarily maintained (i.e., excavated around) so that the depth of excavation can be tracked. Alternatively, the depth of excavation may be monitored with a laser level or other appropriate means.

Upon excavation, soils designated as hazardous based upon in-situ concentrations are to be segregated from non-hazardous soils. As illustrated on the excavation maps, in some areas it will be necessary to remove non-hazardous soils in order to access deeper hazardous soils, and vice versa. In order to maintain cost control, it is paramount that excavation and staging of soil is closely supervised/controlled in order to accurately segregate hazardous and non-hazardous soils, and to minimize over-excavation.

For shallow excavations, maintained stake locations will be excavated only after verification sampling demonstrates that remedial criteria have been achieved. If verification samples do not achieve criteria, excavation and re-sampling will continue at one-foot depth intervals until criteria are achieved at each location.

For deeper areas of the excavations, it is anticipated that groundwater will be encountered. If sufficient groundwater is produced (e.g., pooling in the excavation), consideration will be given to installing a de-watering system such as that discussed in Appendix A. This determination will be made based upon the extent of the potentially impacted areas, and the relative costs of installation/operation versus the added disposal costs associated with wet soil. Water generated will be disposed of in accordance with the PCB Water Treatment Plan (Appendix B).

2.1.4 Verification Procedures

After soils determined to exceed the remedial criteria are excavated, the excavation bottom will be sampled to verify that all soils above the criteria have been removed. If excavations can be entered safely (in accordance with OSHA excavation restrictions), samples will be collected by entering the excavation and collecting the soil sample directly into laboratory-prepared containers. If the excavation cannot be safely entered, the sample will be retrieved utilizing the excavation equipment.

Verification samples will be collected from all locations on the original RFI sampling grid within the excavated area (or immediately adjacent to staked locations in shallow excavations). The number of samples from each area are as follows:

- Bone Yard – 25 locations
- Land Application Area Trenches – 2 locations
- River Lagoon – 44 locations

(Note: In accordance with the CMIP, USEPA 230/02-89/042, "Methods for Evaluating the Attainment of Cleanup Standards, Volume 1: Soils and Solid Media" was consulted for the purpose of statistically determining sample sizes at each area. However, the approaches presented in the USEPA document are predicated on comparing the mean, or alternatively an upper percentile, of the sampling results to the clean-up standard. That is, under the USEPA approach, it is possible for certain sample locations to exceed the clean-up standard and still determine the area is clean. Conversely, the approach selected for the Bainbridge site is to ensure that all locations are below the clean-up standard. Therefore, the USEPA calculations for sample size were not utilized.)

The only exception to the above is the PCB Area, which was not sampled on a grid. After excavation of the PCB Area, five excavation bottom samples and five sidewall samples will be collected and analyzed. Sample locations will be selected in the field to represent the entire area of the excavation.

2.1.5 Stockpile Procedures

Excavated soil will be transported to another on-site location and stockpiled pending characterization sampling (if required by the disposal facility) and loading for transport to the disposal facility. The stockpile location will be selected in the field, but will be asphalt paved and accessible to trucks. The stockpiles will be underlain and covered by 7-mil plastic sheeting to preclude stormwater run-off and run-on. A cross-section of the proposed stockpile is provided on Figure 7.

It should be noted that since site access cannot be controlled at the River Lagoon, excavated soil will be transported directly to the main property for stockpiling.

2.1.6 Stockpile Characterization Procedures

During excavation and stockpiling, PCB soil is to be segregated as hazardous and non-hazardous waste. Therefore, characterization sampling for purposes of disposal is not anticipated to be necessary. However, sampling will be performed as necessary to satisfy any additional requirements of the disposal facilities.

2.1.7 Disposal Procedures

Designated hazardous PCB soils are to be disposed of at a hazardous (secure) landfill. Borden's hazardous PCB soils have previously been disposed of at Chemical Waste Management's Model City Landfill.

Non-hazardous PCB soils are to be disposed of at a non-hazardous (sanitary) landfill. Borden's non-hazardous PCB soils have previously been disposed of at Niagara Recycling's Niagara Falls Landfill and at the Seneca Meadows Landfill.

Waste acceptance will be in accordance with the selected disposal facility's requirements. Manifests will be completed in accordance with NYSDEC and landfill requirements. It is anticipated that the landfills will provide truck transportation as well as disposal.

2.1.8 Equipment Decontamination

At the completion of the project, and otherwise as necessary to prevent the spreading of PCB contaminated soil (e.g., from equipment tires), excavation equipment will be decontaminated. Decontamination will be performed with a hot-water pressure washer within a field-constructed containment basin. The basin is to be constructed of 10-mil, fiber re-enforced plastic sheet within and over a 2X4 wooden frame (i.e., berm). Decontamination solids will be transferred to a hazardous waste soil stockpile for later disposal. Decontamination water will be collected and transferred to the PCB water treatment system as described in Appendix B.

2.1.9 Institutional Controls

Institutional controls consistent with the CMIP may be required for all areas not remediated to one mg/kg. Implementation of these controls is outside the scope of this plan.

2.1.10 Post-Remediation Requirements

Where necessary to mitigate fall hazards or other excavation hazards, excavations will be regraded or backfilled with imported or site-derived clean fill. Imported fill will be obtained commercially from a quarry operation or from a soil recycling operation. If from a soil recycling operation, the supplier will be required to provide certification of cleanliness based upon soil sampling and analysis. Site-derived clean fill will be obtained from background areas in the vicinity of the Land Application Area which were determined to be free from contamination (RFI Report Section 4.2.1.1). Alternatively, clean fill may be obtained from the Land Application Area (not the trenches) if soils are demonstrated to be clean (i.e., below remedial criteria) based upon sampling and analysis.

2.2 Phenol Recovery Area (PRA) Soil

Based upon historical groundwater contaminant concentrations at monitoring well MW-29, as well as RFI soil sampling results, it is known that VOC and phenolic "hot-spot" soil contamination exists in the vicinity of MW-29 and the former phenol recovery unit (Figure 8). This soil is to be excavated and disposed of in accordance with the subsequent sections.

2.2.1 Remedial Criteria

Excavation in the PRA will proceed until 50 ppm or less is detected in the soil headspace utilizing a flame ionization detector (FID) at the excavation limits.

2.2.2 Disposal Criteria

Soils previously excavated from the PRA have been demonstrated to be non-hazardous based upon TCLP analysis. Therefore, soils to be excavated will be designated and disposed of as non-hazardous.

2.2.3 Excavation Procedures

If possible, excavation is to be performed when soil moisture is minimized (e.g., mid to late summer, preferably after a dry period). This will minimize the weight (i.e., disposal cost) of soil moisture, and minimize the presence of groundwater in the excavations.

Prior to excavation, the following tasks will be completed.

- A non-hazardous disposal facility will be selected and contractually secured (e.g., waste profiles approved), and waste transportation will be arranged.
- It will be necessary to remove the concrete foundation of the former phenol recovery unit in order to excavate underlying soil. Since the groundwater treatment system building and blower (including buried electric) are located on the concrete pad formerly used for the phenol recovery unit, they will have to be relocated. Removal and replacement of the groundwater collection sump (Sump 1), and monitoring wells MW-29 and MW-29D may also be required.

Assuming an excavation volume of 50 feet X 50 feet X 10 feet, approximately 1,400 tons of soil will be removed. Soil excavation is to be performed with a backhoe, excavator or similar equipment and under continuous direction of a professional familiar with the PRA sampling data. The excavation is to commence in the general area illustrated on Figure 8. Excavation depth will be at least three feet into groundwater (i.e., potential smear zone).

2.2.4 Verification Procedures

After soils are excavated from the general area illustrated on Figure 8, the first round of verification samples will be collected. Verification samples will be collected from the excavation sidewalls at three feet below grade, and at 10-foot intervals around the excavation perimeter. The samples will be retrieved utilizing the excavation or sampling equipment (personnel will not enter the excavation). Samples will be placed in a plastic "ziplock" bag (approx. half-full), agitated, and allowed to equilibrate. The FID probe will then be inserted into the bag. The highest FID reading will be utilized as the screening result. If verification samples do not achieve the criterion, excavation and re-sampling will continue until the criterion is achieved.

2.2.5 Stockpile Procedures

Excavated soil will be transported to an on-site location and stockpiled as discussed in Section 2.1.5.

2.2.6 Stockpile Characterization Procedures

Borden's non-hazardous PRA soils have previously been disposed of at Niagara Recycling's Niagara Falls Landfill. Since the soils to be excavated are assumed to be equivalent to soils previously excavated, characterization sampling is not anticipated to be necessary. However, sampling will be performed as necessary to satisfy any additional requirements of the disposal facility.

2.2.7 Disposal Procedures

Non-hazardous PRA soils are to be disposed of at a non-hazardous (sanitary) landfill. Waste acceptance will be in accordance with the selected disposal facility's requirements. Manifests will be completed in accordance with landfill requirements. It is anticipated that the landfills will provide transportation as well as disposal.

2.2.8 Equipment Decontamination

At the completion of the project, to prevent the spreading of contaminated soil (e.g., from equipment tires), excavation equipment will be decontaminated. Decontamination will be performed with a hot-water pressure washer within a field-constructed containment basin. The basin is to be constructed of 10-mil, fiber re-enforced plastic sheet within and over a 2X4 wooden frame (i.e., berm). Decontamination solids removed from equipment will be transferred to a PRA soil stockpile for later disposal. Decontamination water will be collected and treated in the existing groundwater treatment system.

2.2.9 Institutional Controls

Institutional controls are not required in the PRA.

2.2.10 Post-Remediation Requirements

Where necessary to mitigate fall hazards or other excavation hazards, excavations will be regraded or backfilled as discussed in Section 2.1.10.

3.0 Corrective Measures Addressing Contaminated Sewers

Based upon the findings of the RFI, sewers at the site have been determined to contain PCB contaminated water and sediments. A generalized illustration of existing and previously removed sewer segments are illustrated on Figure 9. Additionally, a sewer diagram from 1953 is provided in Appendix C. Also illustrated on Figure 9 are the limited available results of sewer sampling. In general, the sewers are to be decontaminated by jet cleaning. The following factors must be considered when completing this task:

- There are no known maps which accurately and completely locate all sewer lines, including laterals added at different stages of facility operation. It will be necessary to trace and mark the sewer lines in the field.

- There are only two existing manholes from which the sewers were able to be accessed. It will be necessary to install additional, temporary manholes at 400-foot intervals to allow access to cleaning and video equipment.

- Most of the sewer segments are located below the water table and/or below the Beatty Creek streambed. Because the sewers leak (extent and flowrate unknown), it will be necessary to contain and/or handle both contaminated and uncontaminated water.

- Sewer segments also run beneath roads, private property, and railroad tracks. Due to previous history of sewer collapse, the segment which runs across Benson's field will be removed after cleaning activities.

3.1 Remedial Criteria

Sewer cleaning will proceed until remedial criteria are achieved. The sewer remedial criteria is as follows: sediment contaminated above one mg/kg PCBs will be removed. It is presumed that removal of contaminated sediments will address contaminated water issues as well.

3.2 Disposal Criteria

Sediments exhibiting a PCB concentration of 50 mg/kg or more are to disposed of in a hazardous waste landfill. The New York State hazardous waste code for PCB waste is B007. Sediments exhibiting a PCB concentration of less that 50 mg/kg are to be disposed of in a non-hazardous landfill.

Any additional PCB analysis, if necessary, is to be reported on a dry weight basis.

3.3 Sewer Cleaning Procedures

If possible, sewer cleaning is to be performed when the water table is depressed and the stream is relatively dry (e.g., mid to late summer, preferably after a dry period). This will minimize the handling/disposal of clean water.

Prior to sewer cleaning, the following tasks will be completed.

- Hazardous and non-hazardous disposal facilities will be selected and contractually secured (e.g., waste profiles approved), and waste transportation will be arranged.

- The "inactive tank" in the PRA will be de-watered to the extent possible in accordance with Appendix B (see Section 3.5) in order to maximize the available water storage capacity.

- Sewers will be located using available facility maps and field instrumentation such as ground penetrating radar. Sewer segments will be marked in the field using paint and/or stakes.

- Utilities within the work area will be cleared and access agreements executed with pertinent property owners.

The sewers will be cleaned utilizing the following procedures:

- Temporary manholes will be constructed at 400-foot (maximum) intervals along the sewer reaches. Manhole construction details are illustrated on Figure 10. The construction details are subject to modification based upon field conditions or other requirements.

- Within a given sewer interval, the pipe discharging into the upgradient manhole will be sealed with an inflatable or expanding plug. This will minimize the inflow of infiltrated water from upgradient. Similarly, the pipe discharging from the downgradient manhole will be sealed with a plug. This will allow containment of contaminated water from the interval to be cleaned, and will prevent re-contamination of the previously cleaned (downgradient) interval.

- If necessary, standing water will be removed from the downgradient manhole with a vacuum truck. If there is sufficient accumulation of sediments in the pipe, the segment will be "pigged" to remove the bulk of sediments.

- Beginning at the downgradient manhole, the sewer cleaning water jet will be inserted into the pipe and advanced to the upgradient manhole. Water and sediment flowing to the downgradient manhole will be removed as it accumulates with a vacuum truck. This process is illustrated on Figure 11.

- If feasible, a system of sedimentation tanks will be utilized to recycle water used for initial jetting. This will minimize the volume of water generated and requiring treatment. Final jetting will be performed with fresh water.

3.4 Verification Procedures

As each segment is cleaned, verification of sewer cleaning will be performed by using video inspection. The verification criterion will be the absence of visual sediment.

If previously unidentified laterals are discovered during the video inspection, the laterals will be cleaned or removed.

In addition, for the sewer segment across Benson's field which is to be removed, if there is evidence of a release based upon video or excavation observations (e.g., soil staining, broken pipe), soil/sediment/bedding sampling will be conducted beneath the pipe. If there are only a few areas of potential contamination, samples will be collected at the locations of the potential releases (e.g., cracks). If there is evidence of potential contamination along the entire reach of the segment across Benson's field, samples will be collected at 50-foot intervals. This sampling will be conducted after sewer removal. If necessary, any soil/sediment/bedding exhibiting a PCB concentration above one mg/kg will be excavated and disposed of as described in Section 2.1.

3.5 Waste Handling Procedures

As previously discussed, PCB contaminated water and sediments will be collected from temporary manholes directly into a vacuum truck. When the vacuum truck tank is full, wastes will be taken to the PRA "inactive tank". This tank has been previously used to stage and treat PCB contaminated water. Water (and some sediment) will be pumped into the inactive tank and treated in accordance with the PCB Water Treatment Plan (Appendix B).

Sediments which cannot be pumped from the tank will be manually shoveled from the tanks into 55-gallon drums or, if sufficiently dry, into stockpiles constructed as described in Section 2.1.5.

3.6 Waste Characterization Procedures

Treatment, characterization, and disposal of PCB contaminated water is addressed in Appendix B.

Based upon available sampling data (Figure 9), sediments within the eastern half of the sewer are contaminated above 50 mg/kg PCBs (i.e., hazardous), whereas sediments within the western half are contaminated at less than 50 mg/kg PCBs (i.e., non-hazardous). No additional waste characterization sampling is anticipated.

3.7 Disposal Procedures

Hazardous PCB sediments are to be disposed of at a hazardous (secure) landfill. Borden's hazardous PCB soils have previously been disposed of at Chemical Waste Management's Model City Landfill.

Non-hazardous PCB sediments are to be disposed of at a non-hazardous (sanitary) landfill. Borden's non-hazardous PCB sediments have previously been disposed of at the Seneca Meadows Landfill.

Waste acceptance will be in accordance with the selected disposal facility's requirements. Manifests will be completed in accordance with NYSDEC and landfill requirements. It is anticipated that the landfills will provide transportation as well as disposal.

3.8 Equipment Decontamination

At the completion of the project, and otherwise as necessary to prevent the spreading of PCB contaminated soil, sewer cleaning equipment will be decontaminated. Decontamination will be performed with a hot-water pressure washer within a field-constructed containment basin. The basin is to be constructed of 10-mil, fiber re-enforced plastic sheet within and over a 2X4 wooden frame (i.e., berm). Sediments removed from equipment will be transferred to a hazardous waste drum or stockpile for later disposal. Decontamination water will be collected and transferred to the PCB water treatment system described in Appendix B.

3.9 Institutional Controls

Institutional controls are not required for sewers.

3.10 Post-Remediation Requirements

The following post-remedial tasks will be performed:

- All temporary and permanent manholes will be closed and abandoned in accordance with authorization from NYSDEC.
- The Benson's field sewer segment will be removed and the excavation re-graded as necessary.

4.0 Corrective Measures Addressing Contaminated Groundwater

The water table in the Phenol Recovery Area occurs at approximately four to six feet below grade. The water table aquifer has been determined to be contaminated with phenolics, formaldehyde, and VOCs (e.g., toluene) above NYSDEC groundwater protection standards. Based upon the most recent groundwater monitoring data, the horizontal extent of the plume in excess of NYSDEC standards is depicted on Figure 12.

The aquifer is to be remediated by in-situ bioremediation. Initially, the bioremediation system will consist simply of an air sparging network. This technology was selected based upon the successful treatment during IRM implementation by aerating (air sparging) contaminated groundwater in the treatment tank. If necessary, the air sparging system may be augmented in the future, for example, by injection of nutrients and/or commercial microorganisms.

(It should be noted that alternative technologies such as in-situ oxidation may be investigated and implemented to reduce contamination in the groundwater. These alternative technologies will be implemented only after review and approval by the NYSDEC.)

4.1 Conceptual Design

Conceptually, the in-situ bioremediation system is equivalent to an in-place bioreactor. Specifically, air sparging wells will be installed into the aquifer and screened beneath the zone of contamination. Air (oxygen) will be injected into the aquifer through the sparge wells. As oxygen migrates upward through the zone of contamination, the available oxygen will stimulate indigenous microorganisms to biologically degrade contaminants. Biodegradation will address both the dissolved phase and adsorbed phase.

Assuming a sparge well grid of 50 feet, a conceptual air sparging plan is illustrated on Figure 13. The actual sparge well grid, as well as other design parameters, will be determined by pilot testing.

4.2 Pilot Air Sparging Test

A pilot air sparging test will be conducted with the following objectives:

- Ensure that off-site migration beyond Beatty Creek is mitigated,
- Verify reduction of contaminant mass in the test area of the plume,
- Determine full-scale design parameters such as injection pressure and well spacing.

4.2.1 Pilot Test Design

A pilot test of in-situ bioremediation is to be performed within the contaminant plume, in the vicinity of monitoring well MW-15. Two sparge point wells will be installed approximately 10 feet from MW-15. Sparging effectiveness will be measured at monitoring well MW-15, as well as three additional observation wells to be installed for the test. A point-of-exposure (POE) well will also be installed across Beatty Creek to monitor potential off-site migration. The anticipated configuration of the monitoring/observation wells is illustrated on Figure 14. A cross-section of the pilot test area is illustrated on Figures 15 and 16.

All sparge point and observation wells are to be installed utilizing two-inch diameter hydraulic push points (e.g., Geoprobe). One sparge point well will be screened below the plume (i.e., 25 – 30 feet), and one will be screened within the plume (i.e., 15 – 20 feet). Observation wells will be advanced to 10 feet below the water table (approximately 15 feet below grade). Wells will be constructed by placing one-inch by five-foot PVC screen and an appropriate length of PVC riser into the borehole. The annulus around the screened interval will then be backfilled with sand. The annulus around the riser will be backfilled with bentonite chips or cement grout to grade level. After completion, the wells will be developed by agitating and then removing five to 10 well volumes of water.

4.2.2 Short-term Pilot Test

Generic air sparging design parameters are presented in Table 1. Also included in Table 1 are parameters to be utilized in the Borden site test. The pilot test is to be conducted at each sparge point well as follows:

- Prior to initiating the test, baseline data will be obtained from all observation wells (including MW-15 and MW-15D). Parameters to be monitored are listed in Table 2.

- An air compressor will be purchased which is capable of producing 10 cfm at 25 psi. It will be housed in a weather-resistant housing and supplied with an adequate electrical power supply.

- The air supply line will be run to one of the sparge point wells and connected with appurtenances as illustrated on Figure 17.

- The air compressor will be activated. From an initial pressure of eight psi or less, the regulator will be adjusted in two psi increments until the air pressure is sufficient to initiate sparging (critical pressure). (Allow five minutes for each increment to allow time to displace water from the well.) The regulator will be adjusted incrementally up to 15 psi above the critical pressure. (The upper limit of pressurization is intended to prevent pneumatic fracturing of the aquifer.) Air flow readings will be obtained from the rotameter and recorded for each pressure increment. Air flow will be plotted against pressure during the test. The test will be completed when the plot of flow versus pressure becomes non-linear. This test will be repeated at least three times. For repeat tests, the pressure increment may be modified.

- Testing is to proceed by sparging for an extended period of time at the optimum flow/pressure setting (i.e., at the plot breakpoint). Parameters listed in Table 2 are to be monitored in each observation well on an hourly basis for six hours, then at 12 and 24 hours after initiation of the test. These data will be used to determine the air sparge well radius of influence.

- At the conclusion of the short-term pilot test, data (e.g., dissolved oxygen, bubbling) will be evaluated to determine the radius of influence of the sparge well and other full-scale design parameters.

4.2.3 Long-term Pilot Test

At the conclusion of the short-term test, air sparging will continue for one year using the deeper sparge point well at the optimum air flow/pressure setting (e.g., 5 cfm/15 psi). Long-term monitoring is discussed in Section 5.3.

4.3 Continued Operation of IRM Pump-and-Treat

The IRM pump-and-treat system will continue to operate through the pilot test phase, and until the final remedy is approved by NYSDEC and implemented. After full-scale implementation, the IRM system will remain operational (in shut down mode) in case the final remedy is inoperable for an extended period of time. The IRM system may not be dismantled without prior approval of NYSDEC.

(As previously discussed, IRM operation will have to be temporarily discontinued as follows. First, treatment components (e.g., blower) will have to be relocated prior to soil excavation in the PRA. Second, groundwater collection will be temporarily suspended as necessary to treat PCB-contaminated water in the inactive tank, as discussed in Appendix B.)

4.4 Submission of Full-Scale Design

After the completion of the short- and long-term air sparging pilot testing (i.e., testing complete one year after initiation), a determination will be made as to whether pilot testing criteria have been achieved (Section 4.2.3). If the pilot test has been successful, a full-scale air sparging design will be submitted to NYSDEC within 60 days. The design will include:

- Air sparge grid network based upon contamination delineation sampling (Section 5.1) and zone of influence (Section 4.2.2).
- Optimum pressure and air flow (Section 4.2.2).
- Well and appurtenance design.

If the pilot test has not been demonstrated to be successful within the first year, a plan for augmenting the system, or for implementing an alternative corrective action technology, will be provided to NYSDEC.

5.0 Start-up Monitoring Plan

This start-up monitoring plan addresses monitoring requirements for the PRA pilot test.

Post-excavation groundwater monitoring of the Bone Yard and PCB Area are not addressed in this plan (see CMI Plan Section 2.7). Additionally, a monitoring plan for full-scale corrective measures will be submitted after full-scale implementation.

5.1 Pre-pilot test monitoring

Prior to implementation of pilot testing, groundwater samples will be collected from MW-15 and MW-15D and analyzed for the presence of contaminant degrading micro-organisms. These data will be compared to post-treatment samples to determine if microbiological populations have increased as expected.

5.2 Short-term Pilot Test Monitoring

Short-term pilot test monitoring (i.e., 24 hours) is discussed in Section 4.2.2.

5.3 Long-term Pilot Test Monitoring

see CMIP different?

For long-term pilot test monitoring (i.e., one year), the groundwater quality of MW-15 will be monitored on a quarterly basis. The criterion for determining the success of the pilot test is a 50 percent reduction in the total contaminant concentration at MW-15 within one year. Total contaminant concentration is defined as the sum of VOCs, phenolics, formaldehyde, and TICs based upon laboratory analysis of groundwater samples from MW-15. In addition to these parameters, dissolved oxygen concentrations and redox potential will also be monitored on a quarterly basis.

Quarterly monitoring will also be conducted at the point-of-exposure well in order to evaluate whether off-site migration is being mitigated. This determination will be made by documenting the contaminant trend at the POE well. A declining or stable trend of contamination at the POE well will be interpreted as mitigation of off-site migration during the pilot test. Analytical parameters are the same as those for MW-15.

5.4 Phenol Recovery Area Groundwater Monitoring

During the period from approval of this Remedial Design until full-scale implementation of corrective measures, the following monitoring wells will be sampled on a quarterly basis in the PRA: Sump-1, Sump-3, MW-16, MW-19, MW-20, MW-27, MW-29, MW-29D, MW-30, MW-34, and MW-35. Each well sample will be analyzed for formaldehyde, phenolics plus TICs, and BTEX. (Analysis of BTEX in lieu of the full VOC scan is a cost saving measure. Based upon historic sampling data, BTEX constituents will drive the cleanup of VOCs.)

This sampling program is in addition to the program described in Section 5.3.

6.0 Schedule

The anticipated schedule for implementation of corrective measures is illustrated on Figure 18. Please note this schedule is subject to change and is dependent upon the time required to review/approval this document, conditions encountered in the field including inclement weather, requirements for iterative soil excavation, failure of the pilot test, etc.

7.0 Health and Safety Plan

The contractor(s) selected for implementation of corrective actions will be required to first develop and implement a site-specific Health and Safety Plan. Topics to be covered in the Plan will include worker safety (e.g., hazard notification, safe work practices, personal protective equipment, decontamination) and public safety (e.g., access restriction, posting).

8.0 References

American Petroleum Institute, *In-Situ Air Sparging*, API Publication 1628D, July 1996.

KVA Analytical Systems, *An Update of Zone Control for Spargepoint Groundwater Treatment Systems*, Technical Bulletin No. 98, April 28, 1994.

USEPA, *Analysis of Selected Enhancements for Soil Vapor Extraction*, EPA-542-R-97-0??, September 1997.

USEPA, *A Technology Assessment of Soil Vapor Extraction and Air Sparging*, EPA/600/R-92/173, September 1992.

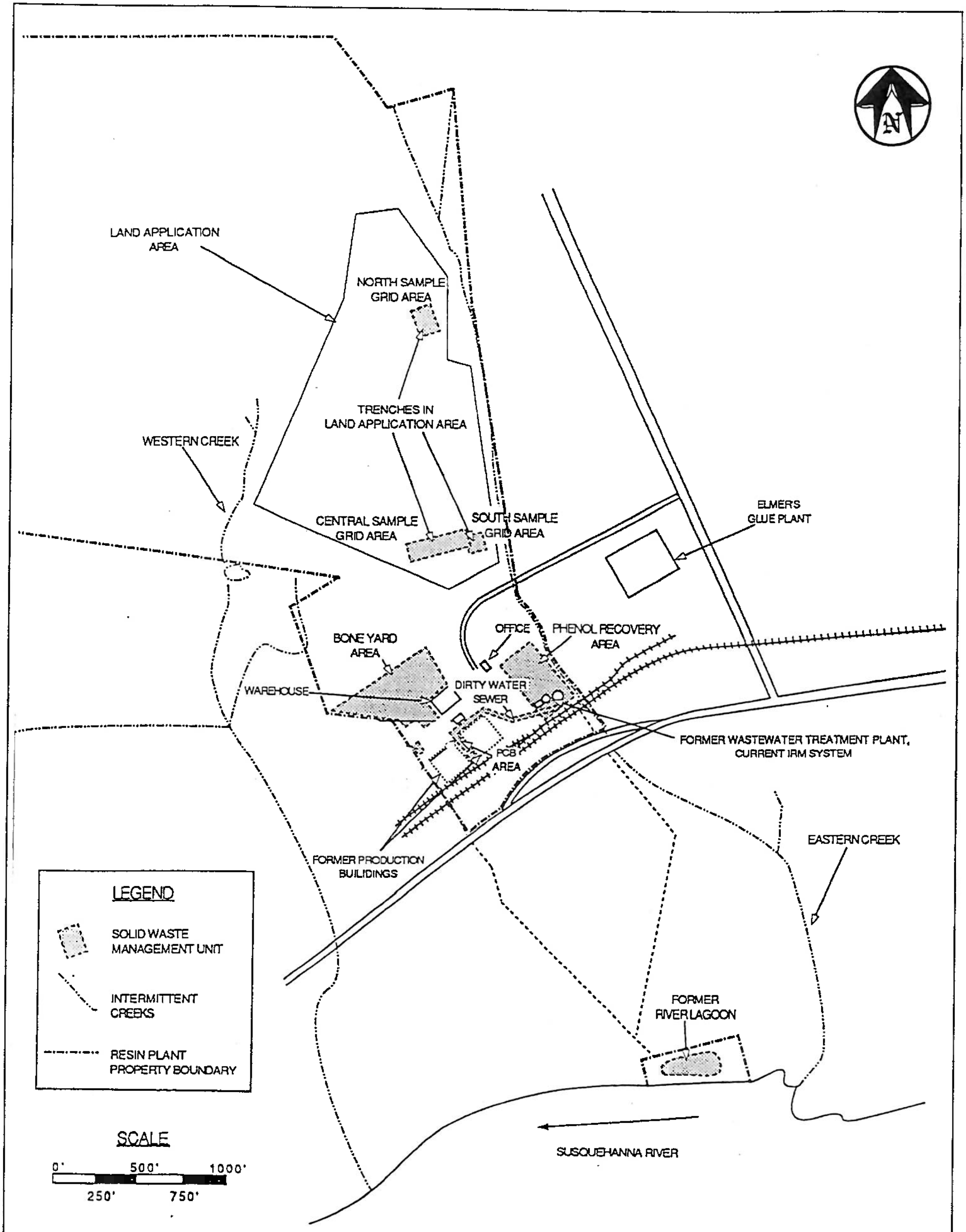

Figure 1		Former Borden Resin Facility Bainbridge, New York Plot Plan & SWMU Locations	LAW LAWGIBB Group Member 801 Washington Avenue, Ste. 330 (606) 581-6031 Newport, Kentucky 41071 FAX (606) 581-6036
Date: 2/1/99	Source: T.M. Gates, Inc.		
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LEGEND

Remedial Criteria: 25 mg/kg

- Extent of Soil Excavation
- 2–3 – Non-hazardous Soil Depth Interval (ft)
- 2–3 – Hazardous Soil Depth Interval (ft)

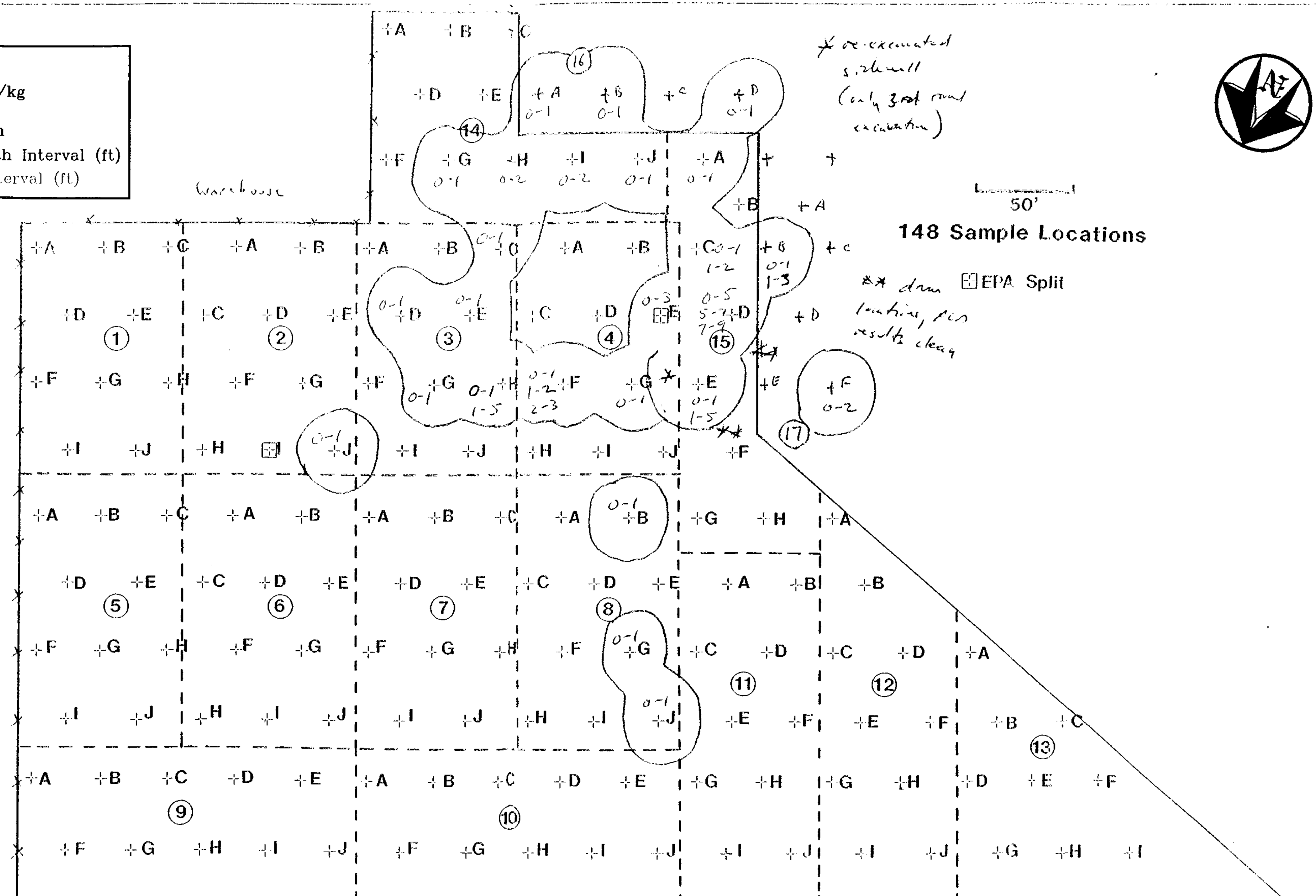

Figure 3	Former Borden Resin Facility Bainbridge, New York Areas Requiring Excavation & Hazardous/Non-Hazardous Depth Intervals (ft) – Bone Yard	LAW LAWGIBB Group Member 601 Washington Avenue, Ste. 330 (606) 581-6031 Newport, Kentucky 41071 FAX (606) 581-6036
Date: 2/1/99 — Source: T.M. Gates, Inc.		
LAW PROJECT NO: 50700.8.0985	File Location: G:\Projects\Cincinnati\Cherokee\Bainbridge\rem desg figs	

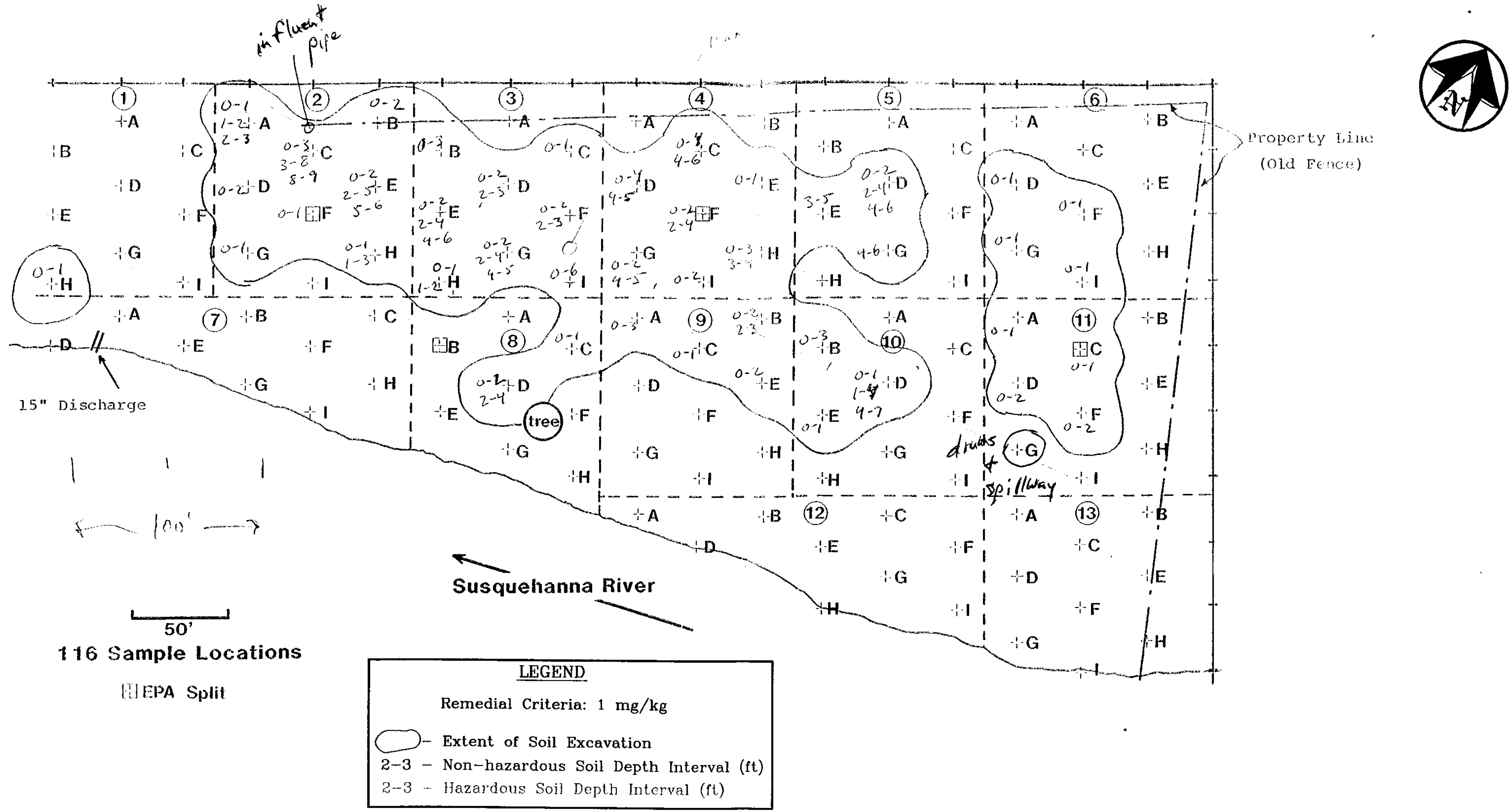

Figure 2

Date: 2/1/99 Source: T.M. Gates, Inc.

LAW PROJECT NO: 50700.8.0985

Former Borden Resin Facility – Bainbridge, New York
Areas Requiring Excavation & Hazardous/Non-Hazardous
Depth Intervals (ft) – River Lagoon

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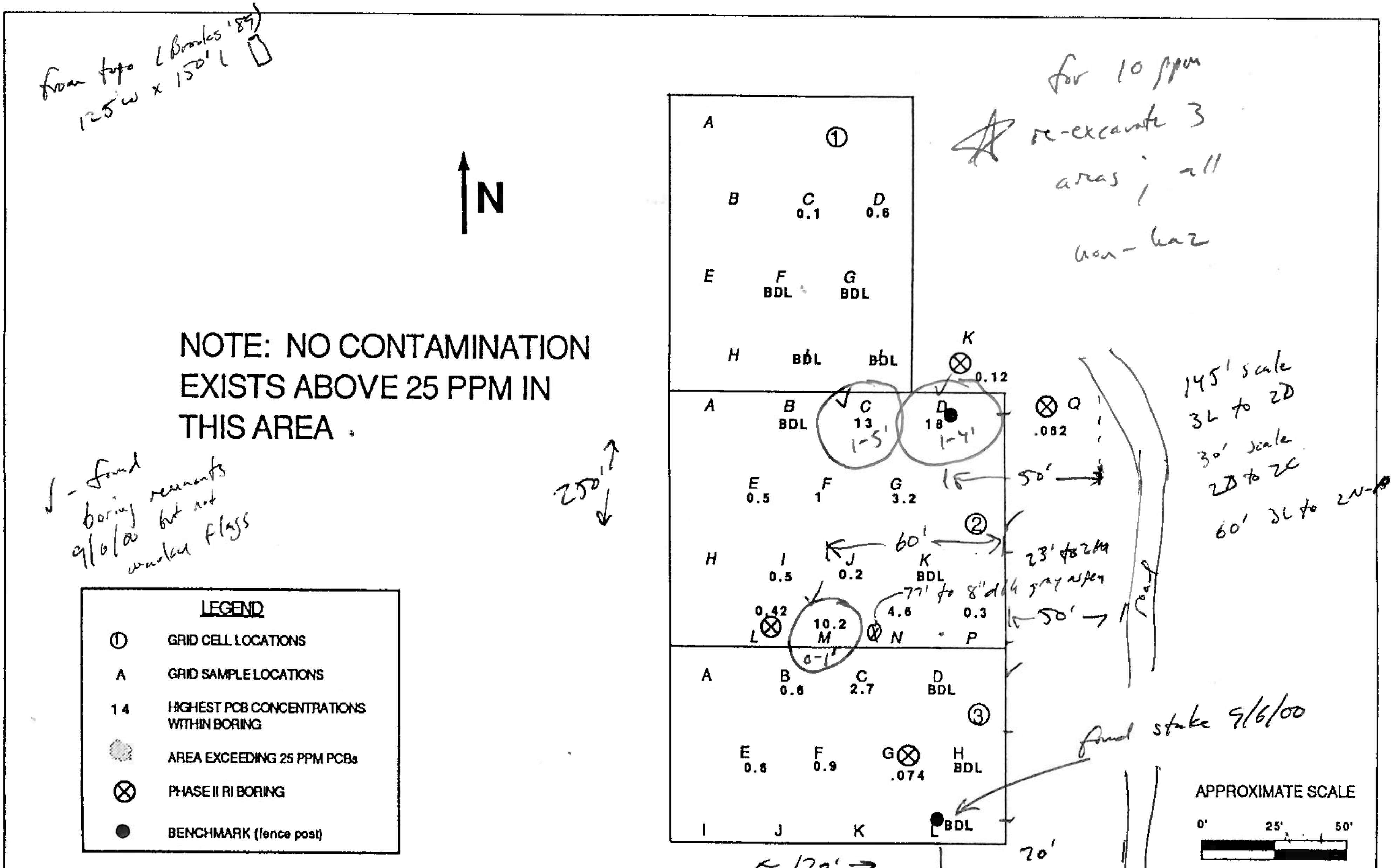

Figure 4

Date: 2/1/99 | Source: T.M. Gates, Inc.

LAW PROJECT NO: 50700.8.0985

Former Borden Resin Facility – Bainbridge, New York
Areas Requiring Excavation & Depth Intervals (ft) – North Trenches

File Location: G:\Projects\Cincinnati\Cherokee\Bainbridge\rem desg figs

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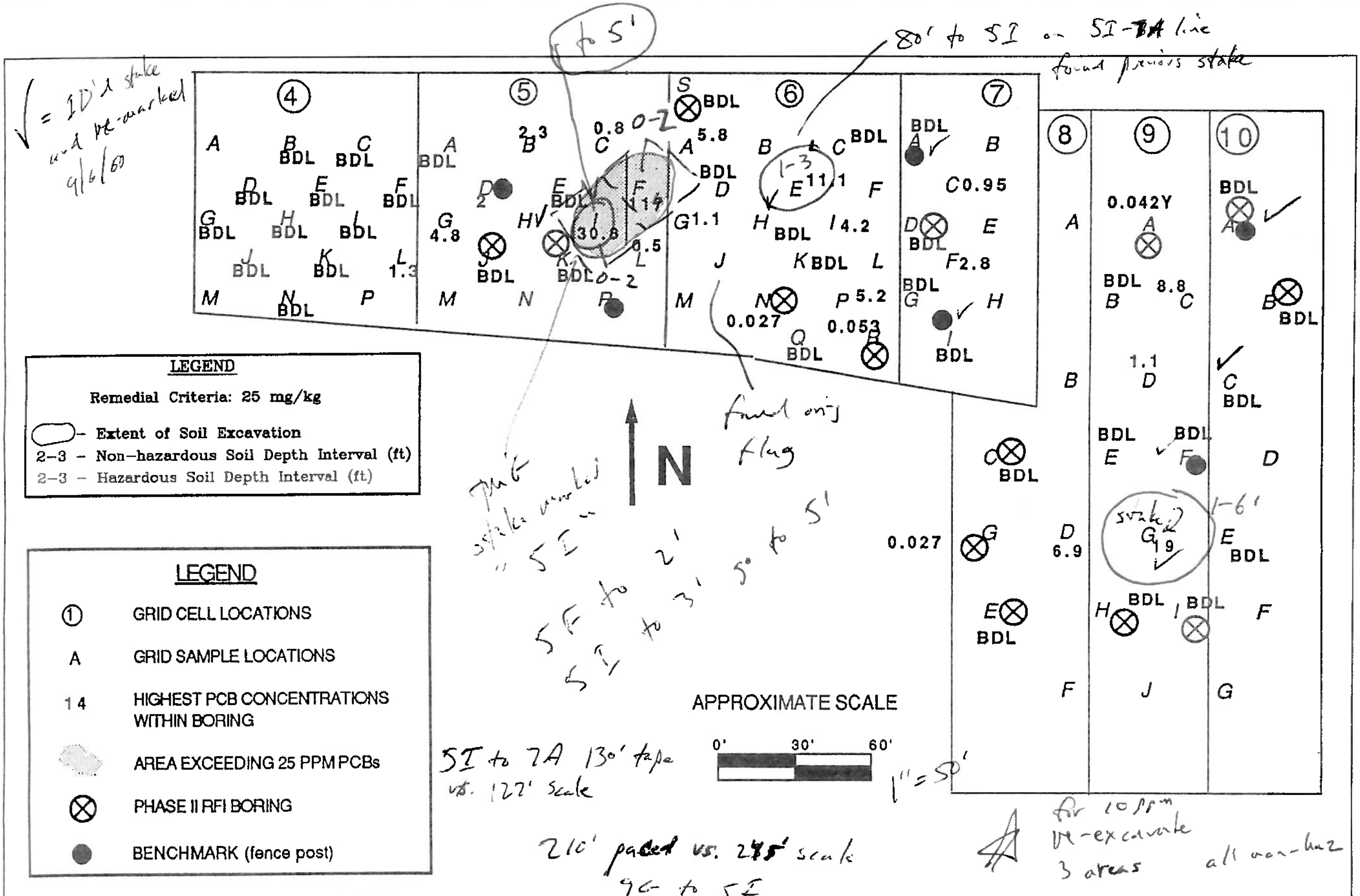


Figure 5	Former Borden Resin Facility – Bainbridge, New York Areas Requiring Excavation & Hazardous/Non-Hazardous Depth Intervals (ft) – Central & South Trenches	LAW LAWGIBB Group Member 601 Washington Avenue, Ste. 330 (606) 581-6031 Newport, Kentucky 41071 FAX (606) 581-6036
Date: 2/1/99 — Source: T.M. Gates, Inc.		
LAW PROJECT NO: 50700.8.0985	File Location: G:\Projects\Cincinnati\Cherokee\Bainbridge\rem deeg figs	

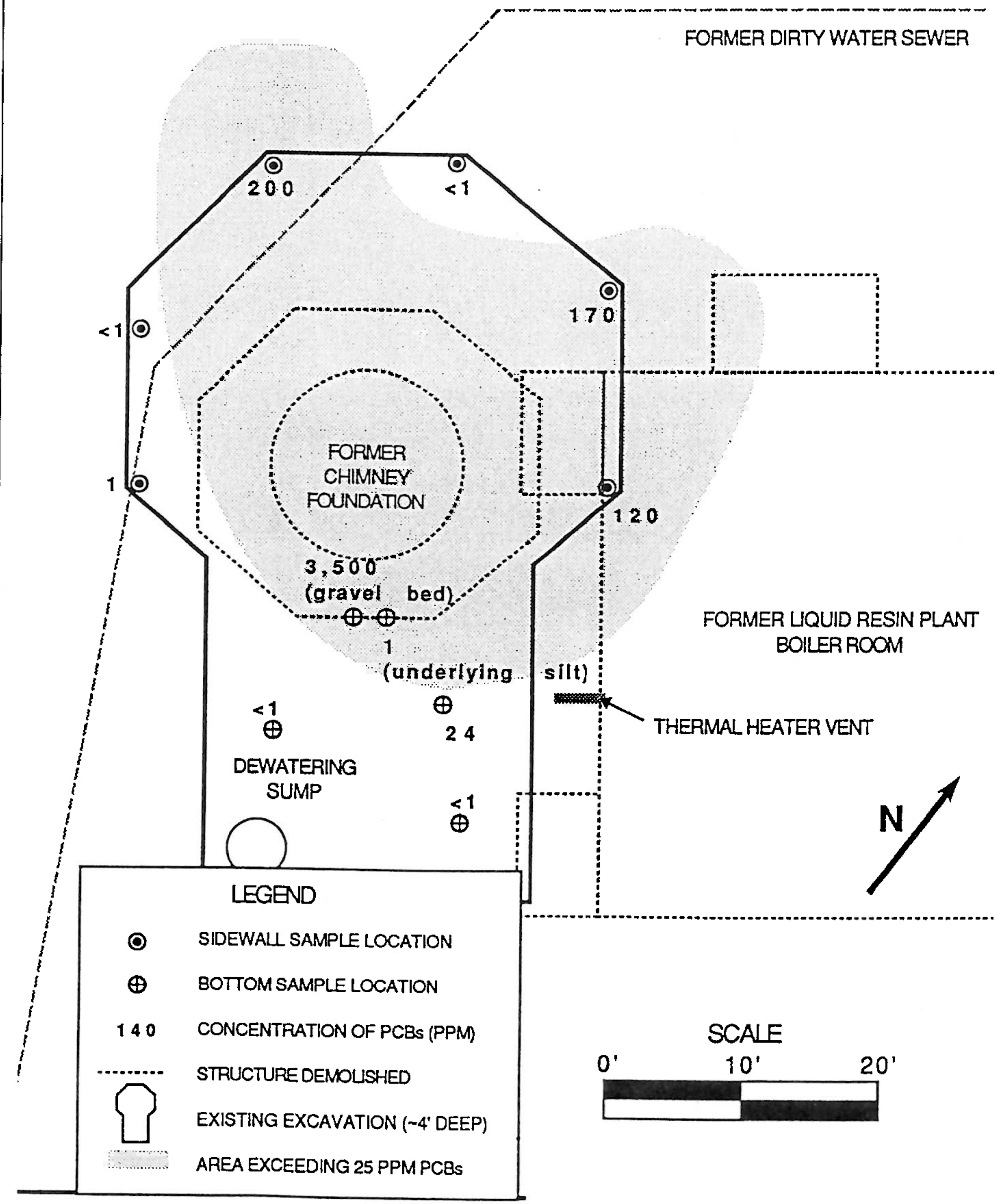
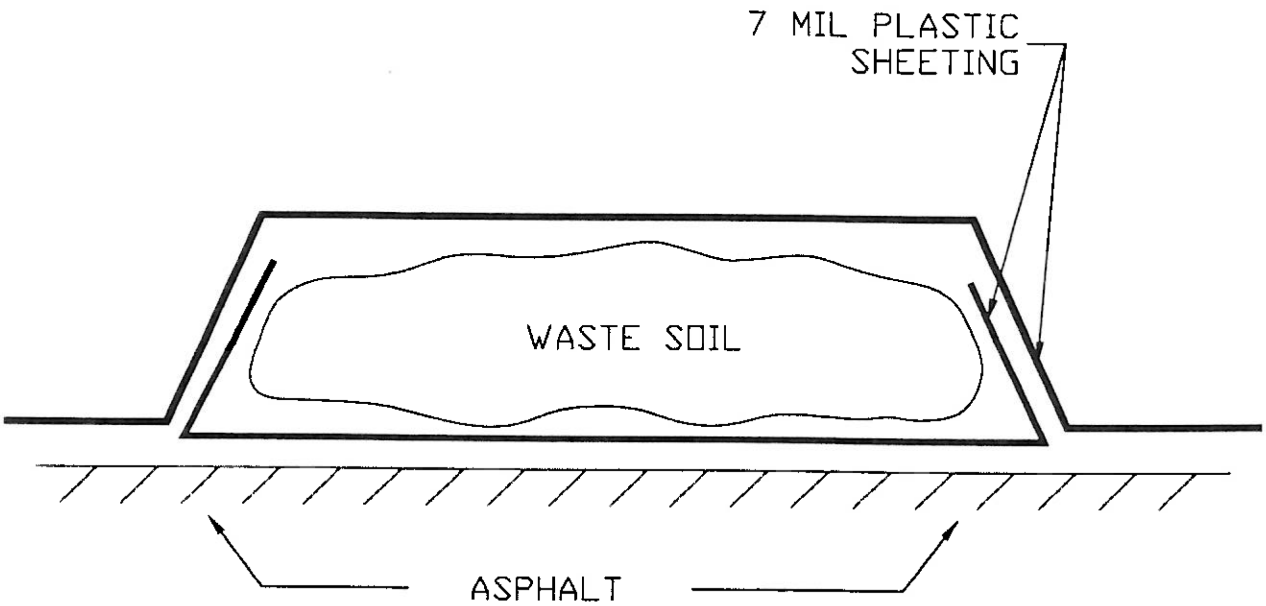
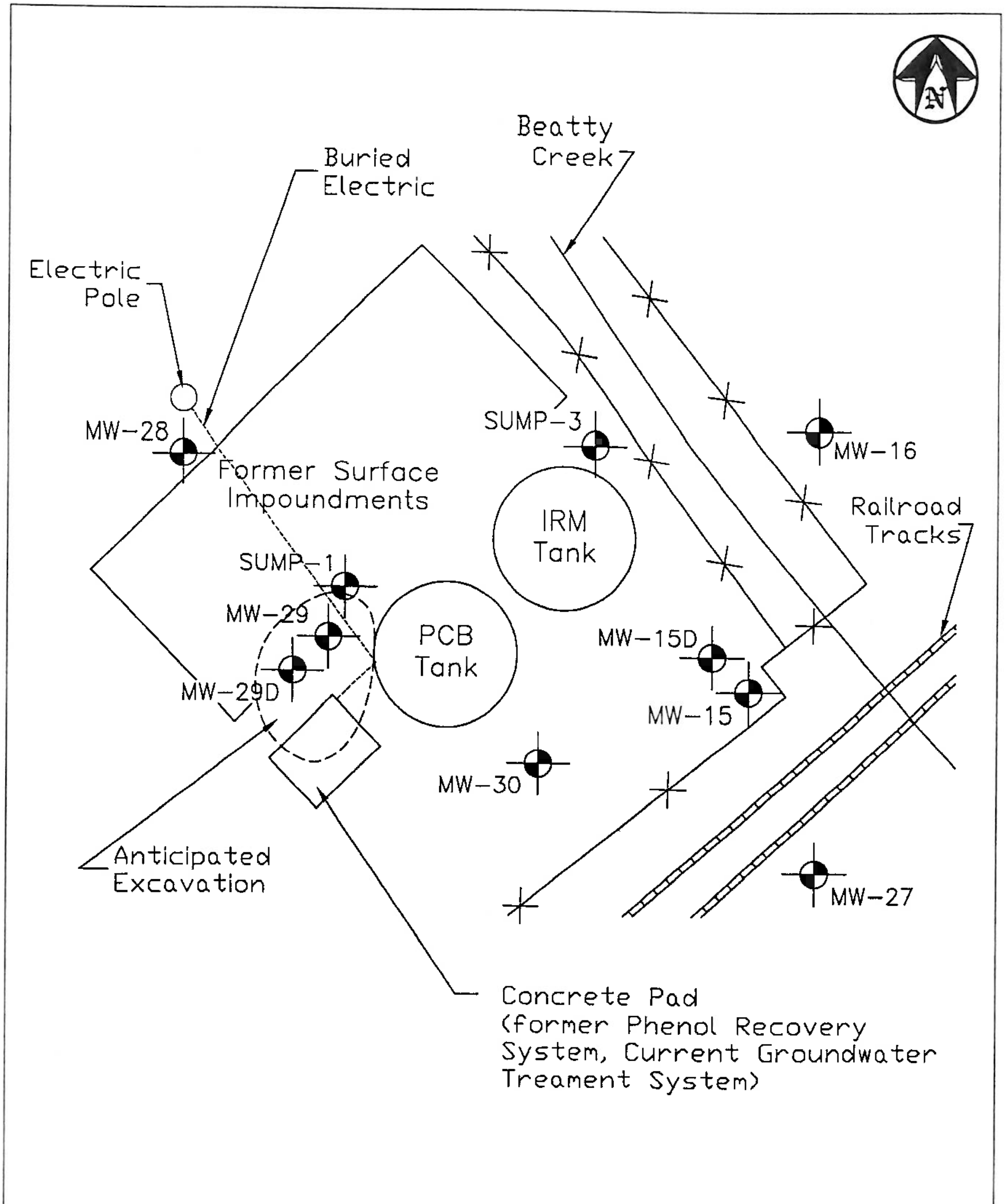


Figure 6		Former Borden Resin Facility Bainbridge, New York Area Requiring Excavation – PCB Area	LAW LAWGIBB Group Member 601 Washington Avenue, Ste. 330 (606) 581-6031 Newport, Kentucky 41071 FAX (606) 581-6036
Date: 2/1/99	Source: T.M. Gates, Inc.		
LAW PROJECT NO: 50700.8.0985		File Location: G:\Projects\Cincinnati\Cherokee\Bainbridge\rem desg figs	



DRAWN BY MJH	DATE 11/23/98	LAW LAWGIBB Group Member
CHECKED BY SKF	11/23/98	Soil Stockpile Cross-Section
SOURCE SKETC H	11/23/98	PROJECT NAME Former Borden Facility Bainbridge, New York
FIGURE NO. 7		SIZE A — PROJECT NO. 50700.8.0985 — REV
		APPROX. SCALE: NTS — FILE NAME: G:\Projects\Cincinnati\Cherokee\Bainbridge\0985fig11.dwg — SHEET: 1 OF 1



DRAWN BY MJH	DATE 11/23/98	LAW ENGINEERING AND ENVIRONMENTAL SERVICES
CHECKED BY SKF	11/23/98	Anticipated Area Requiring Excavation – Phenol Recovery Area
SOURCE SITE PLAN ADAPTED FROM: BLOCK & CLARK'S NATIONAL SURVEYORS NETWORK	1/18/96	PROJECT NAME Former Borden Facility Bainbridge, New York
FIGURE NO. 8		SIZE A · PROJECT NO. 50700.8.0985 · REV
		APPROX. SCALE: 1" = 120' · FILE NAME: G:\Projects\Cincinnati\Cherokee\Bainbridge\0985fig12.dwg · SHEET: 1 OF 1

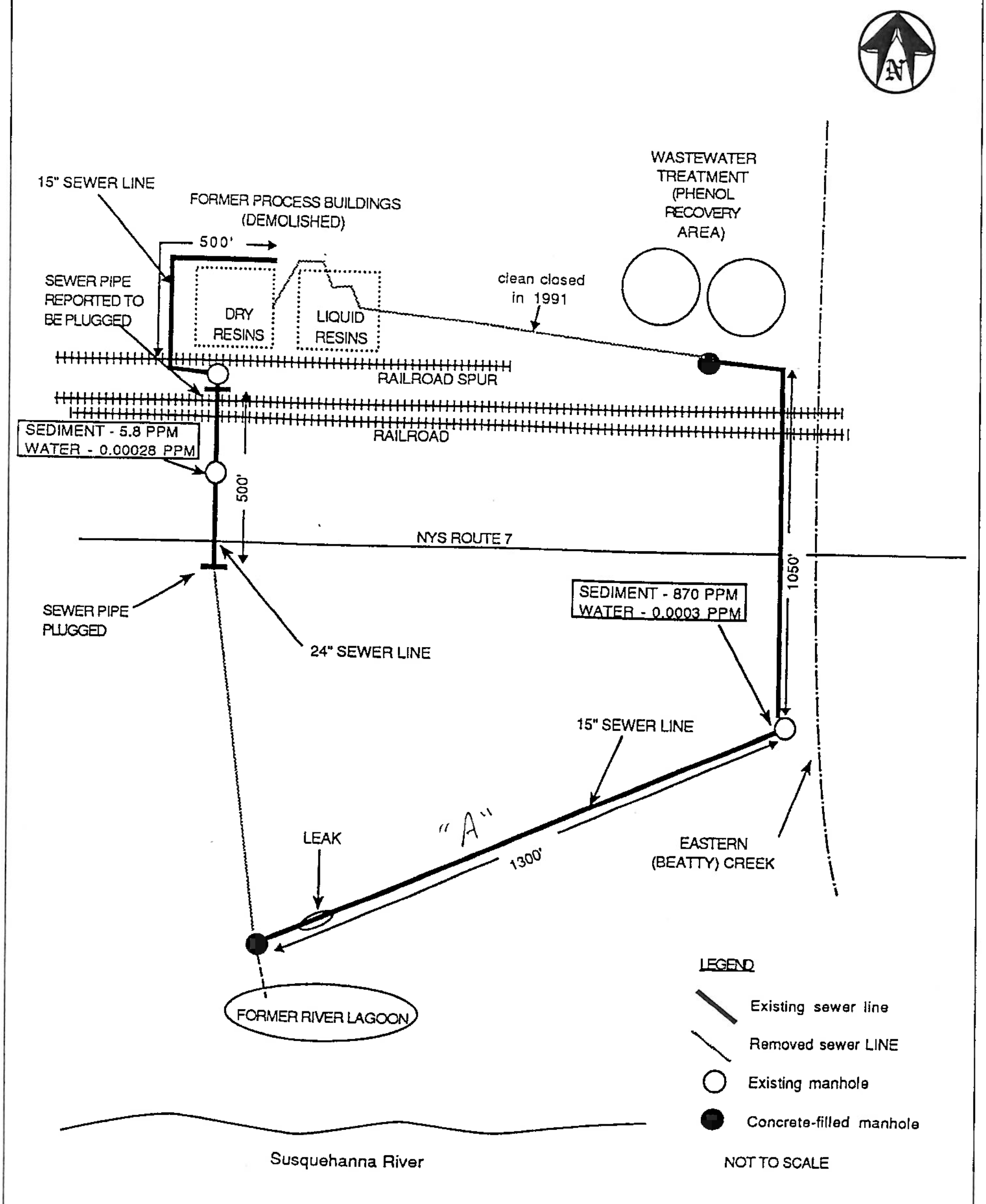
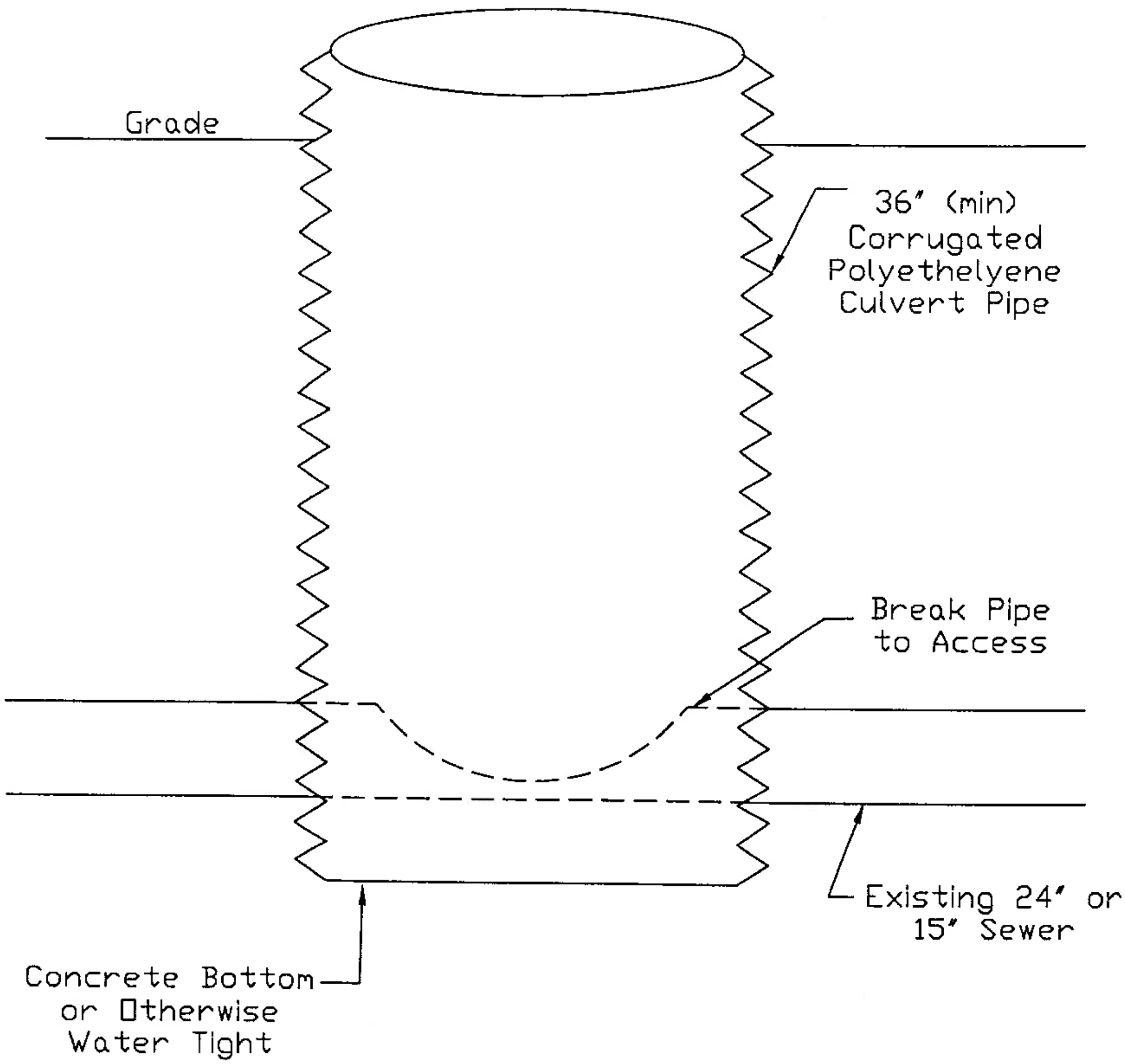


Figure 9		Former Borden Resin Facility Bainbridge, New York Former Resin Plant Wastewater Sewers & PCB Sample Results	LAW LAWGIBB Group Member 601 Washington Avenue, Ste. 330 (606) 581-6031 Newport, Kentucky 41071 FAX (606) 581-6038
Date: 2/1/99	Source: T.M. Gates, Inc.		
LAW PROJECT NO: 50700.8.0985		File Location: G:\Projects\Cincinnati\Cherokee\Bainbridge\rem desg figs	



DRAWN BY JLR	DATE 2/1/99	LAW ENGINEERING AND ENVIRONMENTAL SERVICES
CHECKED BY SKF	11/23/98	Manhole Construction Details
SOURCE SITE PLAN ADAPTED FROM: BLOCK & CLARK'S NATIONAL SURVEYORS NETWORK	1/18/96	PROJECT NAME Former Borden Facility Bainbridge, New York
FIGURE NO. 10		SIZE A — PROJECT NO. 50700.8.0985 — REV
		APPROX. SCALE: NTS — FILE NAME: G:\Projects\Cincinnati\Cherokee\Bainbridge\rem desg figs\0985 fig 10.dwg — SHEET: 1 OF 1

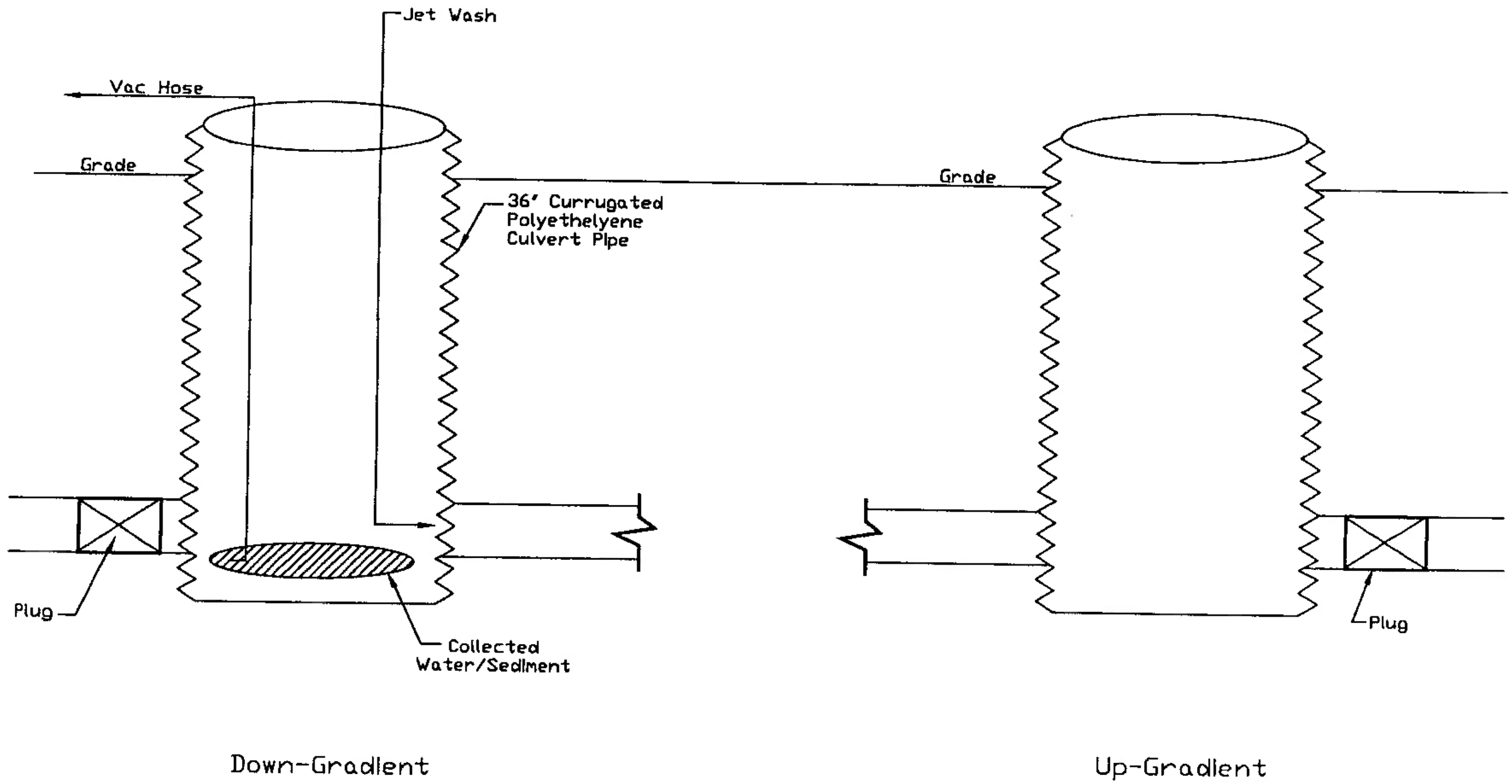
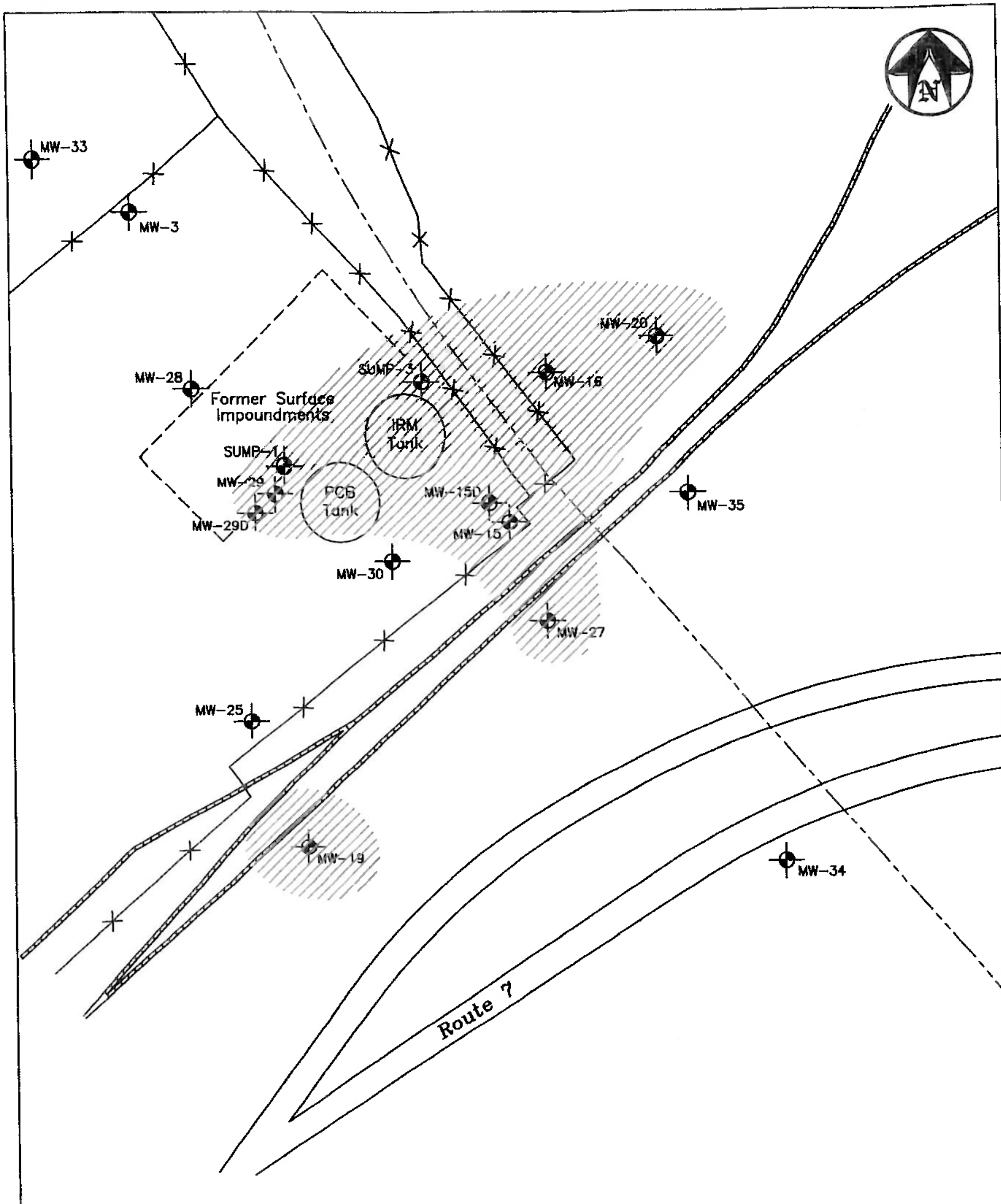
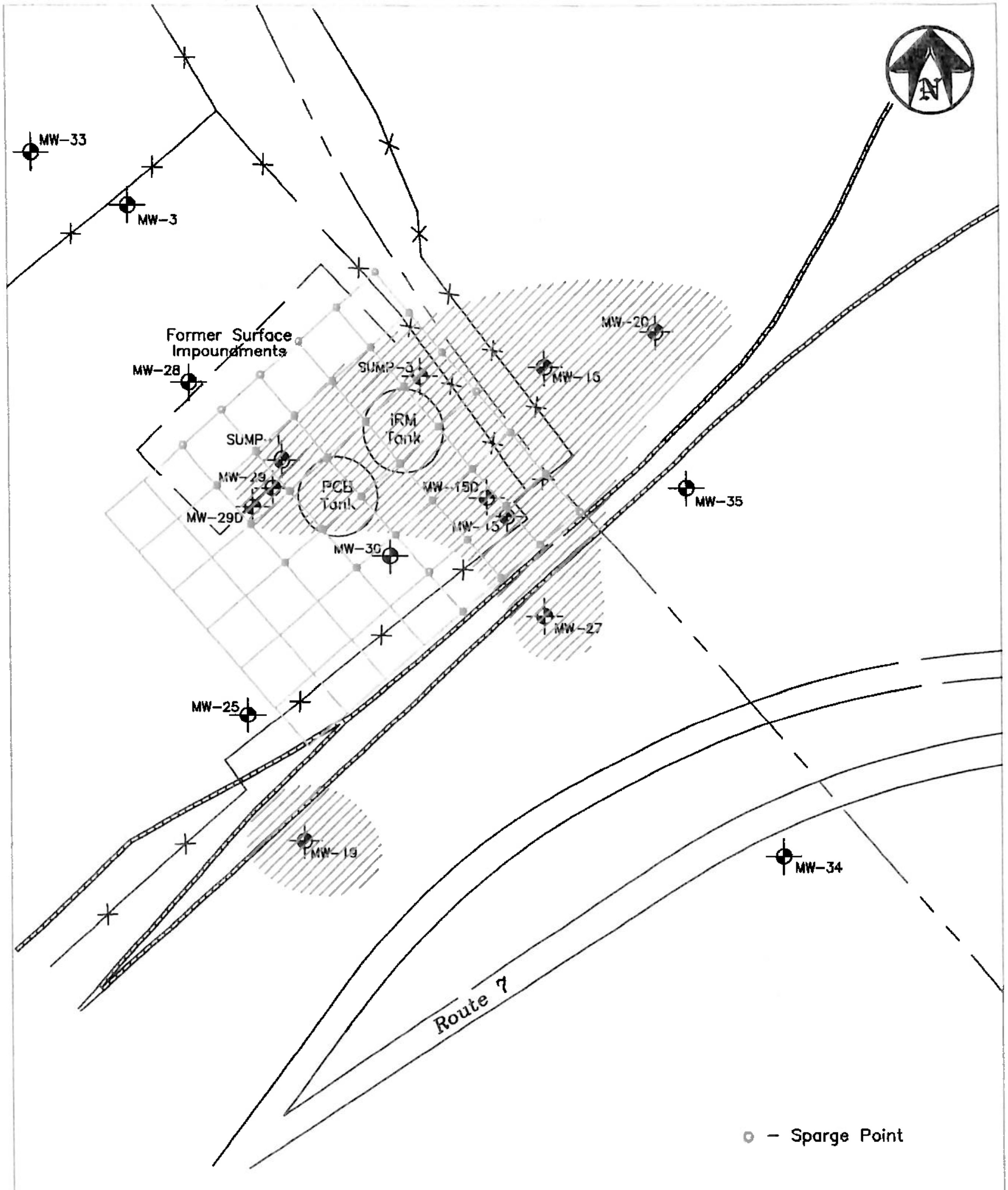


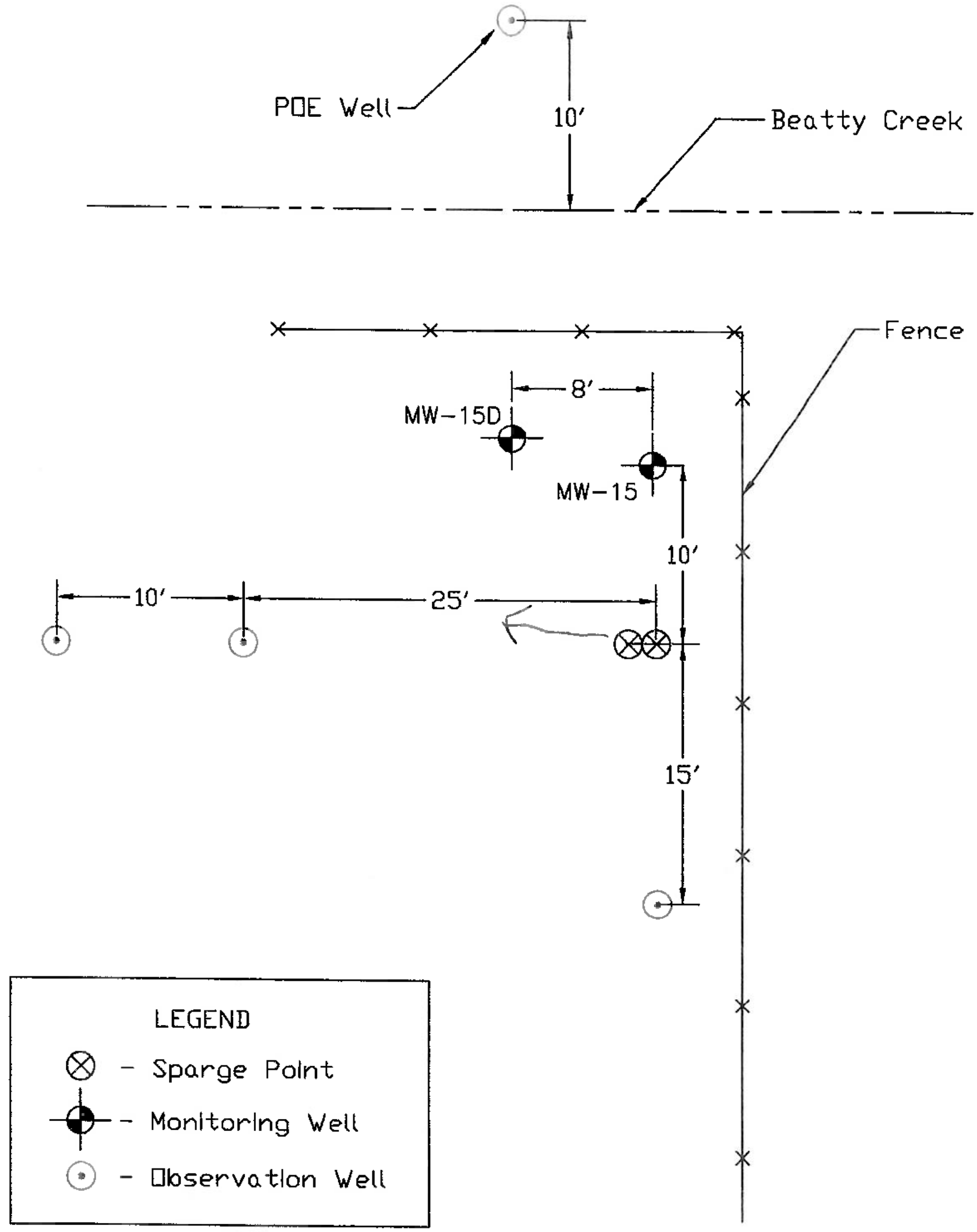
Figure 11	Former Borden Resin Facility – Bainbridge, New York Sewer Cleaning Process	LAW LAWGIBB Group Member 601 Washington Avenue, Ste. 330 (606) 581-6031 Newport, Kentucky 41071 FAX (606) 581-6036
Date: 2/1/99 — Source: T.M. Gates, Inc.		
LAW PROJECT NO: 50700.8.0985	File Location: G:\Projects\Cincinnati\Cherokee\Bainbridge\rem desg figs	



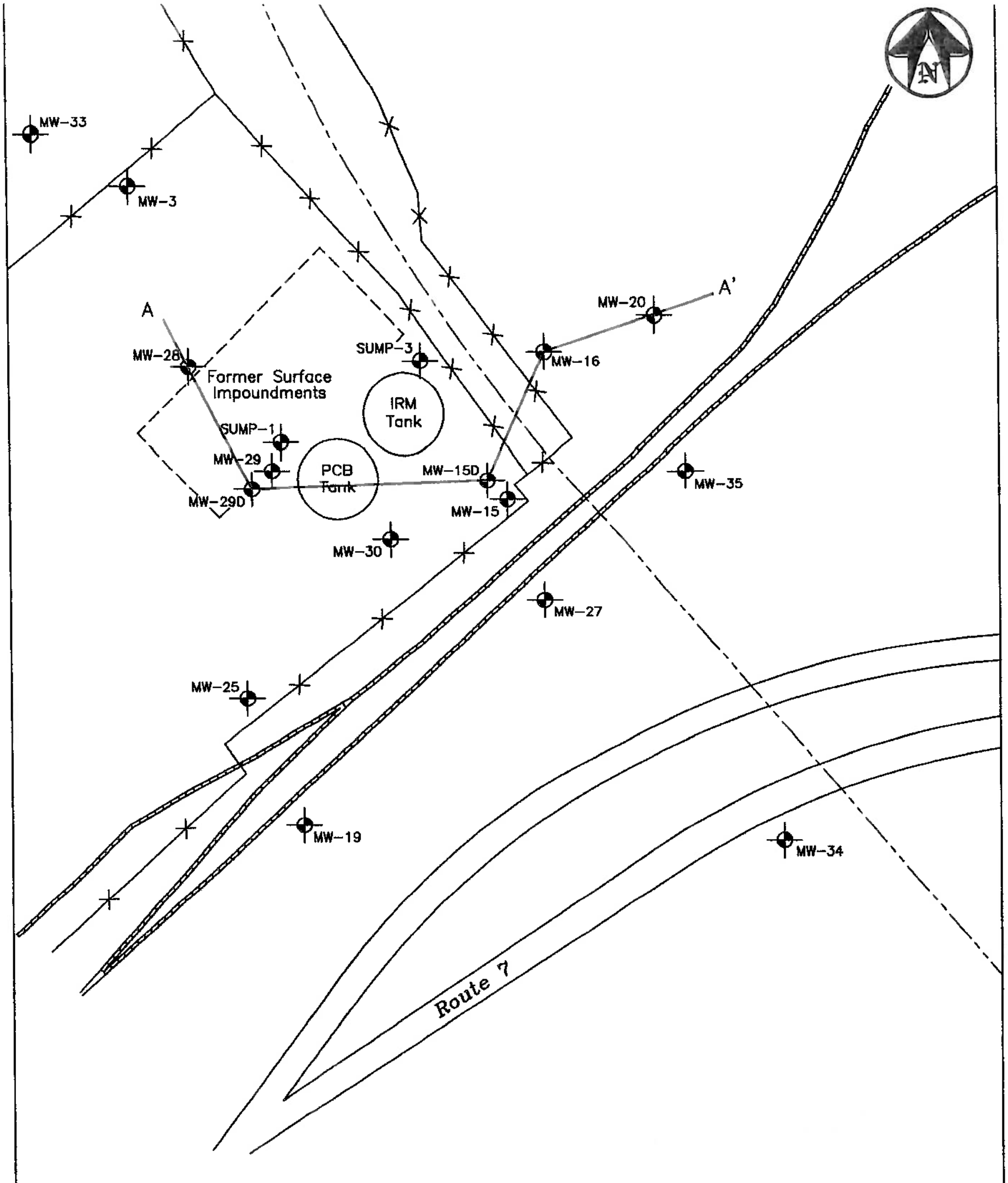
DRAWN BY JGB/JLR	DATE 8/13/98	LAW ENGINEERING AND ENVIRONMENTAL SERVICES	
CHECKED BY SKF	8/13/98	Groundwater Contamination Plume in Excess of Standards – August 1998	
SOURCE SITE PLAN ADAPTED FROM: BLOCK & CLARK'S NATIONAL SURVEYORS NETWORK	1/18/98	PROJECT NAME Former Borden Facility Bainbridge, New York	
		SIZE A	PROJECT NO. 50700.8.0985 / REV
FIGURE NO. 12		APPROX. SCALE: 1" = 120'	FILE NAME: G:\Projects\Cincinnati\Cherokee\Bainbridge\rem dsgn figs\0985 fig 15.dwg / SHEET: 1 OF 1



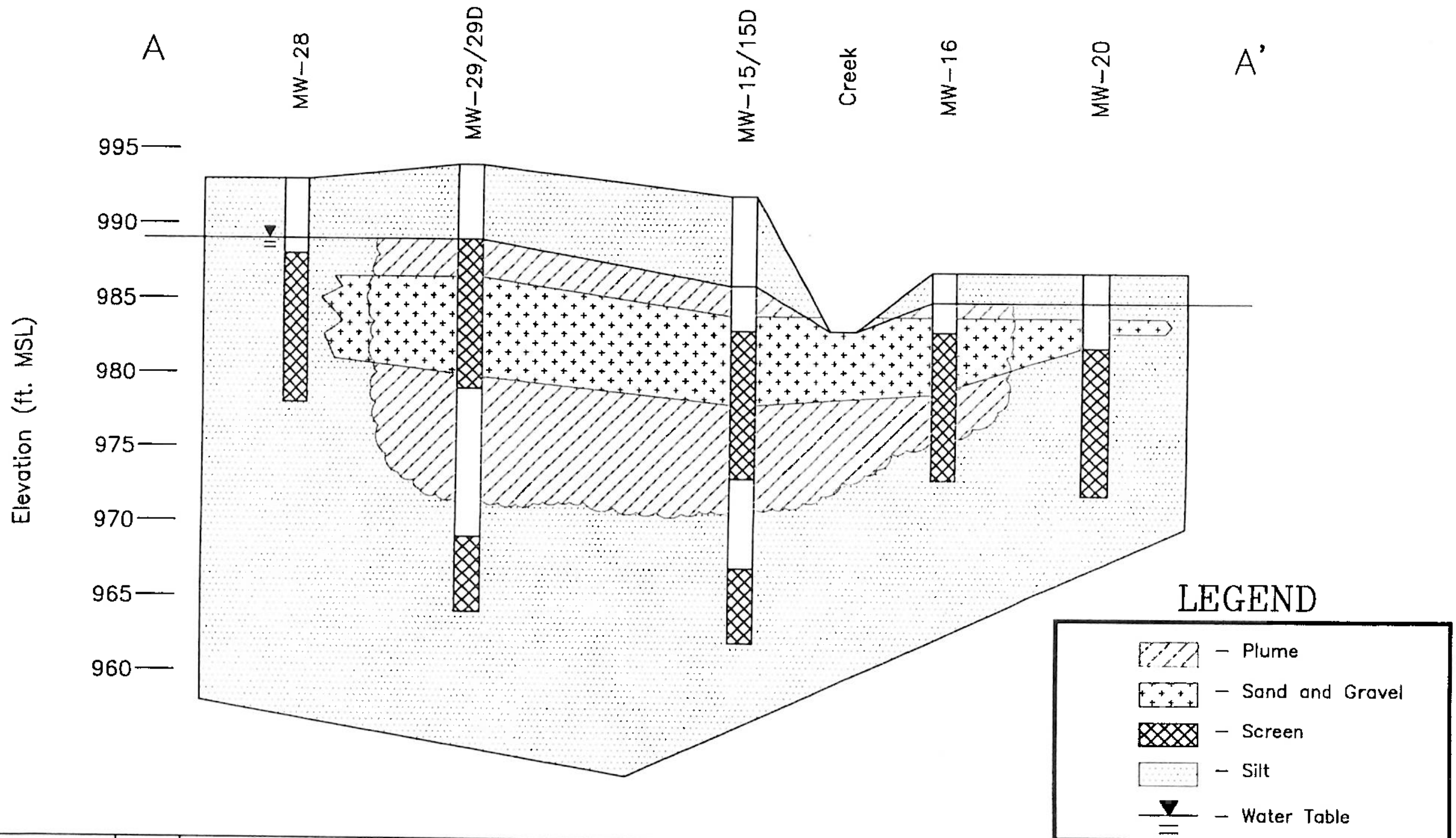
DRAWN BY JGB	DATE 8/4/98	LAW ENGINEERING AND ENVIRONMENTAL SERVICES	
CHECKED BY SKF	8/5/98		
SOURCE		Conceptual Air Sparging Plan	
SITE PLAN ADAPTED FROM: BLOCK & CLARK'S NATIONAL SURVEYORS NETWORK	1/18/96	PROJECT NAME Former Borden Facility Bainbridge, New York	
FIGURE NO. 13		SIZE A / PROJECT NO. 50700.8.0985	REV
		APPROX. SCALE: 1" = 120' / FILE NAME: G:\Projects\Cincinnati\Cherokee\Bainbridge\rem dsgn figs\0985 fig 13.dwg	SHEET: 1 OF 1



DRAWN BY MJH	DATE 11/25/98	LAW ENGINEERING AND ENVIRONMENTAL SERVICES	
CHECKED BY SKF	11/25/98	Pilot Test Plan	
SOURCE SKETCH		PROJECT NAME Former Borden Facility Bainbridge, New York	
FIGURE NO. 14		SIZE A / PROJECT NO. 50700.8.0985	REV
		APPROX. SCALE: NTS / FILE NAME: G:\Projects\Cincinnati\Cherokee\Bainbridge\rem dsgn figs\0985 fig 14.dwg	SHEET: 1 OF 1



DRAWN BY JGB/JLR	DATE 8/13/98	LAW ENGINEERING AND ENVIRONMENTAL SERVICES	
CHECKED BY SKF	8/13/98		
SOURCE		PRA Cross Section Location	
SITE PLAN ADAPTED FROM: BLOCK & CLARK'S NATIONAL SURVEYORS NETWORK	1/16/96	PROJECT NAME Former Borden Facility Bainbridge, New York	
FIGURE NO. 15		SIZE A	PROJECT NO. 50700.8.0985 · REV
		APPROX. SCALE: 1" = 120'	FILE NAME: G:\Projects\Cincinnati\Cherokee\Bainbridge\rem dsgn figs\0985 fig 15.dwg · SHEET: 1 OF 1



REVISIONS	DATE	DRAWN BY	JGB	DATE 11/19/98
		CHECKED BY	SKF	11/19/98
		FIGURE	16	
		Horiz. Scale:	1" = 120'	

PRA Geologic and Plume Cross Section
Former Borden Resin Facility
Bainbridge, New York

LAW PROJECT NO: 50700.5.0985
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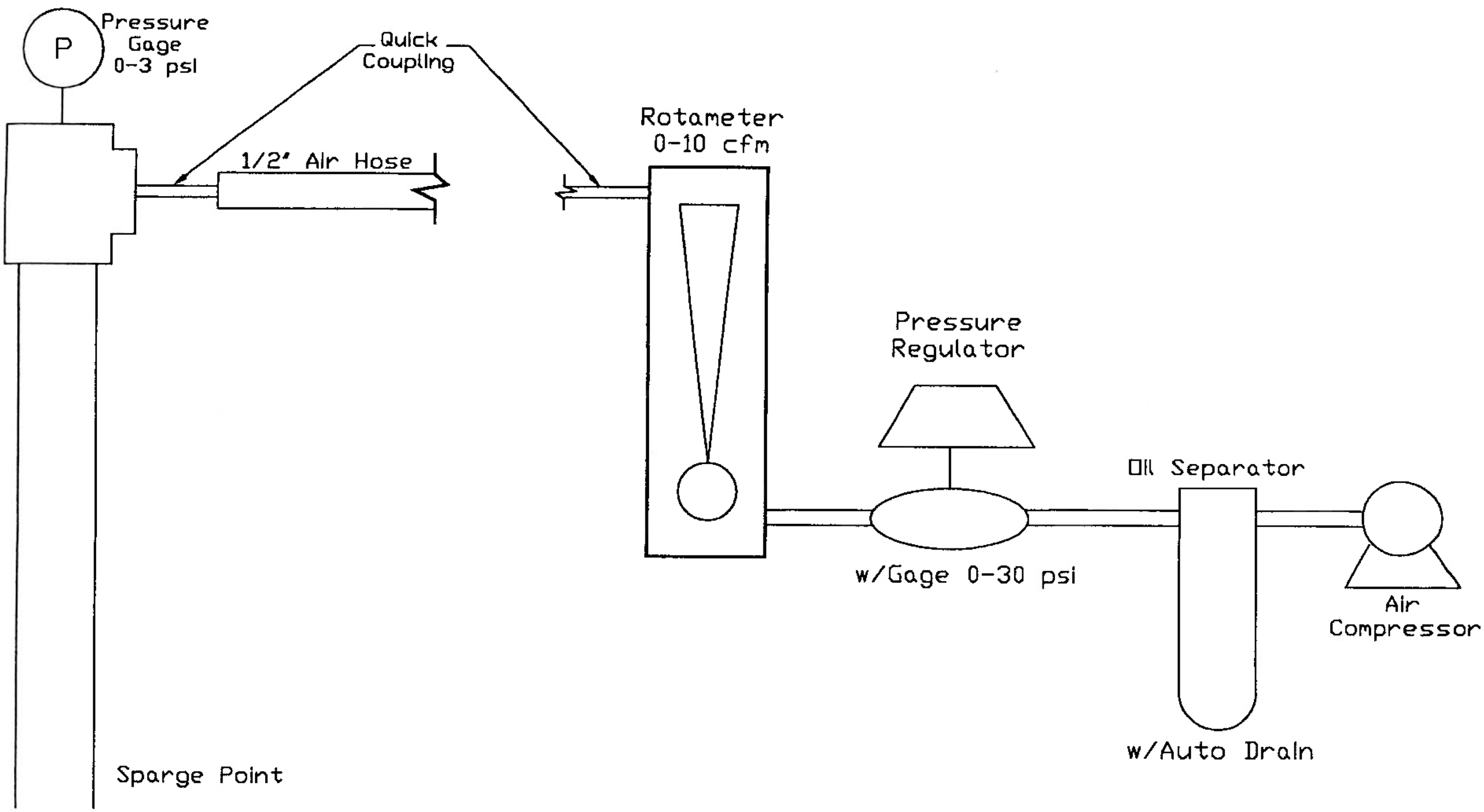

Figure 17		Former Borden Resin Facility – Bainbridge, New York Pilot Test Set-up	LAW LAWGIBB Group Member 601 Washington Avenue, Ste. 330 (606) 581-6031 Newport, Kentucky 41071 FAX (606) 581-6036
Date: 2/1/99	Source: T.M. Gates, Inc.		
LAW PROJECT NO: 50700.8.0985		File Location: G:\Projects\Cincinnati\Cherokee\Bainbridge\rem desg figs	

Former Borden Resin Facility - Bainbridge, New York

Figure 18

Implementation Schedule

Section	Task	Apr-99	May-99	Jun-99	Jul-99	Aug-99	Sep-99	Oct-99	Nov-99	Dec-99	Jan-00	Feb-00	Mar-00	Apr-00	May-00	Jun-00
	Secure soil/sediment disposal facilities															
	Groundwater Corrective Measures															
5.1	Pre-pilot monitoring															
4.2.2	Short-term pilot test															
4.2.3	Long-term pilot test															
5.3, 5.4	Groundwater monitoring			X			X			X			X			
4.4	Full-scale design															X
	Sewer Corrective Measures															
3.0	Trace and map sewers, Install temporary manholes															
3.1.3, 3.1.4	Clean sewers, scope, video															
3.1.7	Dispose of solids															
3.1.7	Treat and dispose of liquids															
3.1.9	Final equipment decontamination							X								
3.1.10	Remove sewer segment, close manholes															
	Soil Corrective Measures															
2.1.3, 2.2.3	Excavation preparations/de-watering															
2.1.3, 2.2.3	Soil excavation															
2.1.4, 2.2.4	Verification sampling															
2.1.7, 2.2.7	Soil disposal															
2.1.10, 2.2.10	Final decon/regrade/backfill															

Former Borden Resin Facility - Bainbridge, New York
Table 1
Air Sparging Design Parameters

Parameter	Typical Design	Borden Design
Sparge depth below ground (ft)	5 ft below contamination	25
Sparge depth below water table (ft)	5 ft below contamination	20
Sparge point diameter (in)	1 (push-point) - 2 (drilled)	2
Sparge screen length (ft)	1 to 5 typical	5
Radius of influence (ft)	10 to 30 typical	To be determined in pilot test
Sparge pressure (psi)	Hydrostatic pressure plus 2 to 5	< 14 anticipated
Sparge rate (cfm)	2 to >5 scfm per sparge point	To be determined in pilot test

Former Borden Resin Facility - Bainbridge, New York
Table 2
Air Sparging Test Parameters

Parameter	Measurement Method
Sparge pressure (psi)	Pressure gauge at well head
Sparge rate (cfm)	Rotameter
Water level or mounding (ft)	Water level meter
Dissolved oxygen (mg/L)	DO meter
Redox potential (mv)	Eh meter
Visual bubbling or agitation	Visual observation

Appendix A: PCB Area De-watering Plan

1.0 Introduction

This plan addresses requirements for de-watering the PCB Area Excavation prior to and during continued remedial excavation. PCB-contaminated water is to be pumped from the excavation to the 190,000 gallon "inactive tank" in the Phenol Recovery Area. This plan is an updated version of the NYSDEC-approved "PCB Area Excavation and Biotank Water, Sediment, and Sludge Disposal, Treatment, Operation and Maintenance Plan" (July 26, 1996). (The "inactive tank" has also been referred to as the "biotank" in past correspondence.) NYSDEC approved the latter plan in a letter dated August 6, 1996.

The existing excavation is approximately four to six feet deep, and contains standing water to approximately two feet below grade. The water level corresponds to the water table elevation. Therefore, it will be necessary to remove standing water as well as continuously infiltrating groundwater in order to continue excavation.

2.0 Excavation Pump-Out

It is estimated that approximately 35,000 gallons of standing water is in the excavation. Immediately prior to excavation, standing water is to be pumped from the existing excavation to the holding tank. The de-watering system is illustrated on Figure A1.

For illustrative purposes, a 3.5 HP centrifugal pump and three-inch discharge hose may be used. The distance to the holding tank is 500 feet, and the elevation difference is approximately 20 feet. Based upon a total head of less than 40 feet, the 3.5 HP pump will pump at a rate of approximately 100 gpm. At this rate, it would take approximately six hours to de-water the excavation. A larger pump and larger hose, if available, may be used to reduce the time required.

3.0 Continuous De-watering

After the standing excavation water is removed, the excavation area will be kept in a de-watered condition as follows:

- At two ends of the de-watered excavation (locations to be determined in the field), sump pits will be excavated to approximately two feet below the bottom of the existing excavation. Slotted culvert pipes (e.g., 24-inch corrugated HDPE) with solid bottoms will be placed in the sump pits to collect water. Approximately one ton of gravel will be placed around each slotted pipe to prevent them from floating out of the excavation.

- Water collecting in the slotted pipes will be continuously pumped. If necessary, submersible sump pumps will be used to transfer water to a frac (temporary) tank located at the excavation. Water will then be pumped using the system described in Section 2.0 to the "inactive tank" in the PRA.

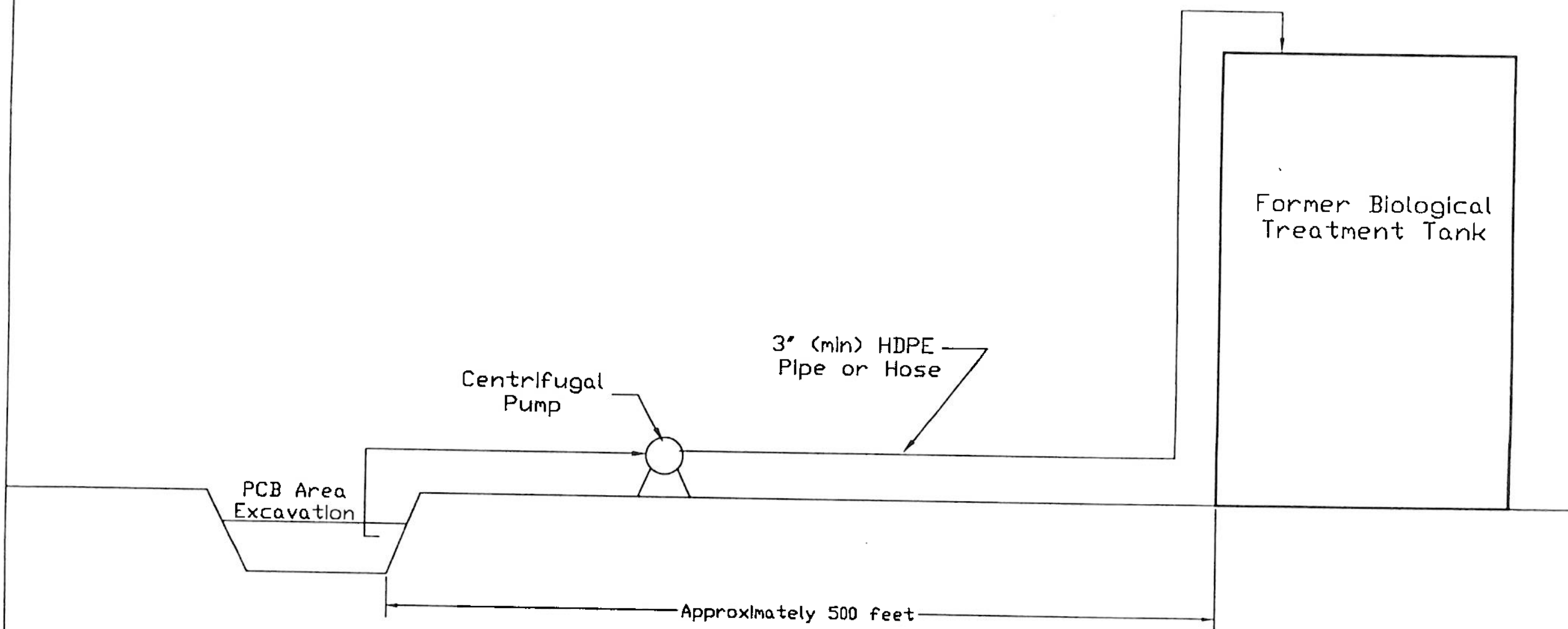

Figure A1	**Former Borden Resin Facility - Bainbridge, New York** **PCB Excavation Area Water Transfer System**
Date: 2/1/99 — Source: T.M. Gates, Inc.	
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Appendix B: PCB Water Treatment Plan

1.0 Introduction

This plan addresses requirements for treatment and discharge of PCB-contaminated water to be stored in the 190,000 gallon "inactive tank" in the Phenol Recovery Area. This plan is an updated version of the "PCB Area Excavation and Biotank Water, Sediment, and Sludge Disposal, Treatment, Operation and Maintenance Plan" (July 26, 1996). (The "inactive tank" has also been referred to as the "biotank" in past correspondence.) NYSDEC approved the latter plan in a letter dated August 6, 1996.

2.0 Treatment/Discharge Procedures

An illustration of the water treatment system is provided in Figure B1.

PCB contaminated water stored in the tank is to be decontaminated on a batch basis. A submersible sump pump placed within the tank will collect and transfer contaminated water to a treatment train consisting of the following components:

- One micron bag filtration (currently existing).
- Main activated carbon filtration (see attached cut sheet).
- Back-up carbon filtration (see attached cut sheet).

Water collection/treatment rate will be maintained at five gallons per minute or less for each pair of carbon units. Treated water will be discharged to the adjacent 350,000 gallon Interim Remedial Measures (IRM) tank pending verification that treatment objectives have been met. (This will require interruption of IRM groundwater collection and treatment for approximately one week per batch. Additionally, the IRM tank must be empty prior to the commencement of PCB water treatment.)

Verification sampling will be conducted by collecting one treated water sample from the IRM tank after batch treatment is complete (i.e., one sample per batch). The treatment objective is 0.1 micrograms per liter (ppb) or less PCBs (Method 8080). Water meeting the treatment objective will be discharged as a batch to the spray application area and/or to Beatty Creek.

3.0 Monitoring of Carbon

Treatment capacity of the main carbon unit will also be monitored by collecting a water sample from a port located between the main and back-up carbon units. One monitoring sample will be collected at the end of each batch of water treated. According to the carbon vendor (Calgon), the main unit should be able to treat over eight batches prior to breakthrough (see attachment).

When PCBs are detected above 0.1 ppb in the main carbon effluent, the main carbon unit will be considered spent. The back-up carbon unit will then be utilized as the main unit, and a new back-up unit will be brought on-line.

4.0 Contingency

In the unlikely event that a verification sample (i.e., IRM tank sample) exceeds the treatment objective, water will be pumped back into the inactive tank and the treatment/verification process will be repeated until the treatment objective is achieved.

5.0 Operation and Maintenance

Operation and maintenance tasks will be performed on a daily (or more frequent) basis and include the following:

- Observe system piping and equipment for leaks.
- Pressure gage inspection to ensure that bag filters are not clogged, and that carbon unit pressure limits (7.5 psig) are not exceeded.
- Tank level monitoring to ensure that the pump doesn't run dry, and that overflow will not occur.
- Measurement of flow rate to ensure proper (< 5 gpm per carbon pair) and efficient operation.

6.0 Waste Disposal

Spent bag filters will be drummed. Drummed filters and spent carbon will be disposed of as PCB hazardous waste (B007).

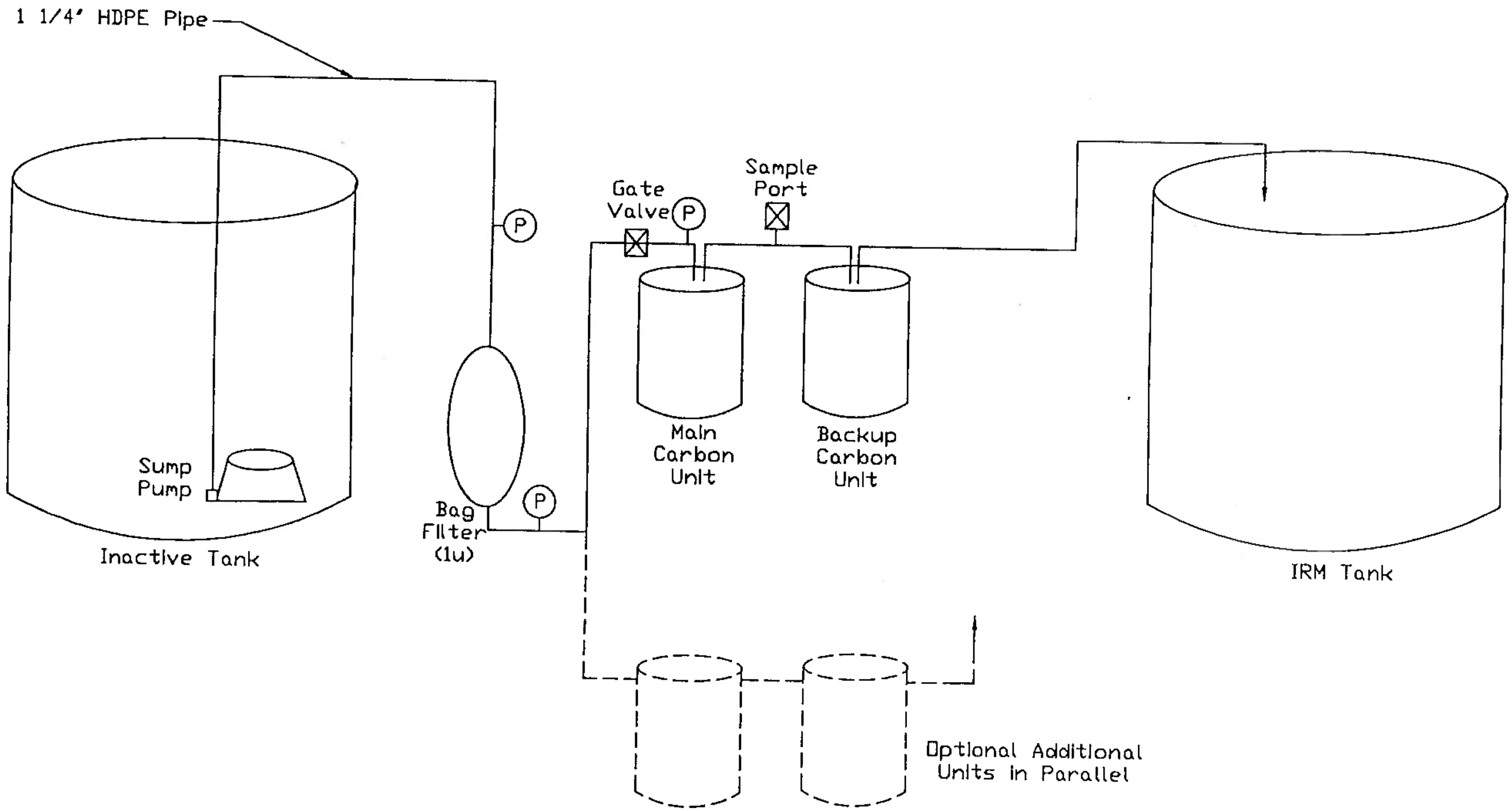

Figure B1	Former Borden Resin Facility – Bainbridge, New York PCB Area Water Treatment System
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CALGON

CALGON CARBON CORPORATION

FAX

To:	Scott Fennell Law Engineering @ 606-581-6036
From:	James S. Ruperto
Date:	November 17, 1998
Pages:	5 (including cover page)

Subject: Treatment of PCB Laden Water

To treat groundwater with PCB contamination, Calgon Carbon recommends using our Disposorb canisters. The attached product bulletin describes these units. There are two sizes available depending on your flow rate. I recommend 15 minutes total contact time, this is either two small units in series at 6 gpm or two large units in series at 35 gpm. Pricing for the large Disposorb is $2,100.00 and for the small Disposorb the price is $495.00. Pricing is for units filled with reactivated carbon and is FOB our facility in Pittsburgh, PA. These units are in stock and available for immediate shipment.

PCB's are well adsorbed with typical use rates of <<0.1 pounds reactivated carbon per 1,000 gallons treated.

If you need additional information, please call me at the phone number given below.

James S. Ruperto

James S. Ruperto
Manager, Applications Engineering
Remediation Services

Phone: (412) 787-4532
Fax: (412) 787-6682

$$\frac{0.1 \text{ lb carb}}{1{,}000 \text{ gal}} \times \frac{190{,}000 \text{ gal}}{\text{batch}} = \frac{19 \text{ lb carb}}{\text{batch}}$$

$$165 \frac{\text{lb carbon}}{\text{drum}} \times \frac{\text{batch}}{19 \text{ lb carbon}} = 8.7 \frac{\text{batch}}{\text{drum}}$$

CALGON

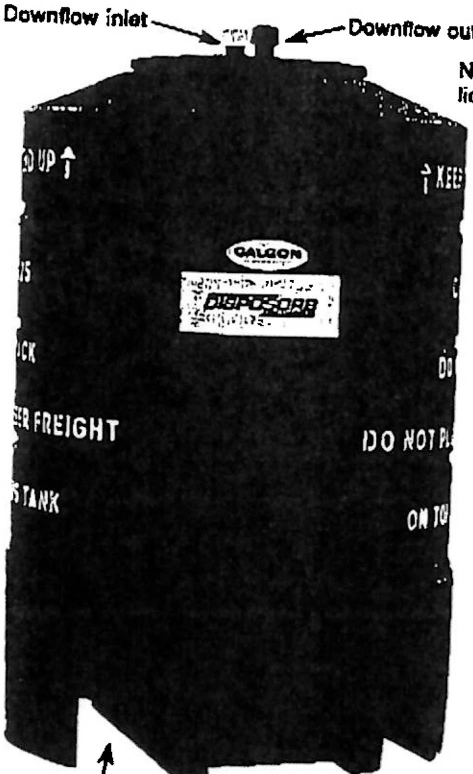
DISPOSORB™

ACTIVATED CARBON PRODUCT BULLETIN

DISPOSORB has been developed by Calgon Carbon Corporation for cleanup of off-spec product batches, accidental spills, contaminated rainwater in tank-farm containment dikes, and many other uses. It is the first disposable, compact, granular activated carbon adsorber providing all the essentials of a full-scale system. Available in two sizes, 350 gallon capacity and 55 gallon capacity.

DISPOSORB APPLICATIONS

- Hazardous/Toxic Dissolved Organic Removal
  - Process Stream Purification
  - In-Plant Spill Treatment
  - Laboratory Bench Drains
  - Storage Tank Washdown
  - Monitoring Well Discharges
  - Dechlorination
  - Decolorization of Liquids
  - Small Wastewater Streams
- Evaluation of Adsorption for Liquid Processes
  - Feasibility Studies
  - Laboratory Investigation
  - Pilot Plant Studies
- Tandem KLENSORB 100/Granular Activated Carbon Operation
  - Multicomponent Treatment
  - Gasoline From Groundwater
  - Hazardous Waste Lagoons



350 gal and 55 gal DISPOSORBS—The unique, low-cost approach for on-the-spot liquid phase uses. Pollution Control, Process Purification.

HOW DISPOSORB WORKS

DISPOSORB contains granular activated carbon which removes dissolved pollutants from water by a process called adsorption. As water passes through the porous granules of activated carbon, molecules of the organic pollutants are attracted to the surface of the pores and are held there by weak physical forces. The phenomenon is somewhat similar to iron filings being held by a magnet.

The ability of granular activated carbon to remove large quantities of organic impurities is a function of its highly developed internal pore structure. This unique pore structure is created during the manufacturing process, which involves the crushing and thermal "activation" of select grades of bituminous coal under carefully controlled conditions. As a result of this processing, an extensive network of pores is created inside each carbon granule, providing an enormous internal surface area.

Granular activated carbon's great porosity is responsible for its high capacity for trapping and holding organic molecules. For example, just one pound of carbon granules has an effective total (external and internal) surface area equal to that of a 100-acre farm.

In general, the adsorption capacity for non-polar organic compounds increases with concentration, molecular weight and decreased solubility. Compounds which adsorb well are aromatic and unsaturated aliphatic compounds and halogenated solvents.

Low-molecular-weight (less than 50) and/or high-polar compounds, highly soluble in water—such as formaldehyde, alcohols, glycols-will not be readily adsorbed.

When the concentration of organic wastes in the effluent equals the concentration in the influent, the DISPOSORB unit is saturated with the maximum organic loading possible.

THE INSIDE STORY

Each 350 gallon DISPOSORB is filled with approximately 1000 pounds of either Filtrasorb 300 or Filtrasorb 400 products. These carbons are manufactured from select grades of bituminous coal to produce a high density, high surface area, durable granular product suitable for use in either potable or wastewater applications.* The 55 gallon DISPOSORB is filled with approximately 165 pounds of these carbons. The DISPOSORB may be ordered with other types of carbons for use in unique applications. In addition, DISPOSORB units can be provided with Klensorb 100. Klensorb 100 is a granular absorbent media which removes insoluble oil (both free and emulsified) and similar heavy organic compounds from water. Klensorb 100 units can be used for treatment independently or in tandem with carbon units.

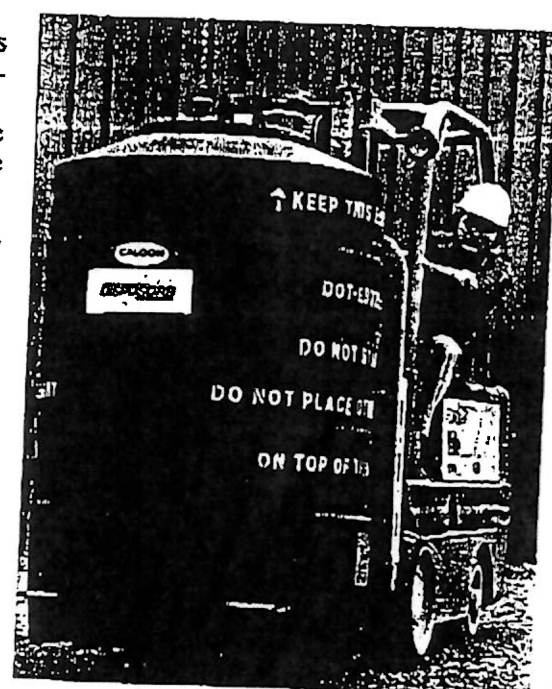
The internals of the DISPOSORB are a combination of PVC and stainless steel. In applications involving contaminants which attack these materials, alternative internal construction materials can be ordered.

DISPOSORB units are constructed of polyethylene. They are not suitable for applications where solvents of high-density polyethylene are present in large concentrations or at temperatures above 140°F.

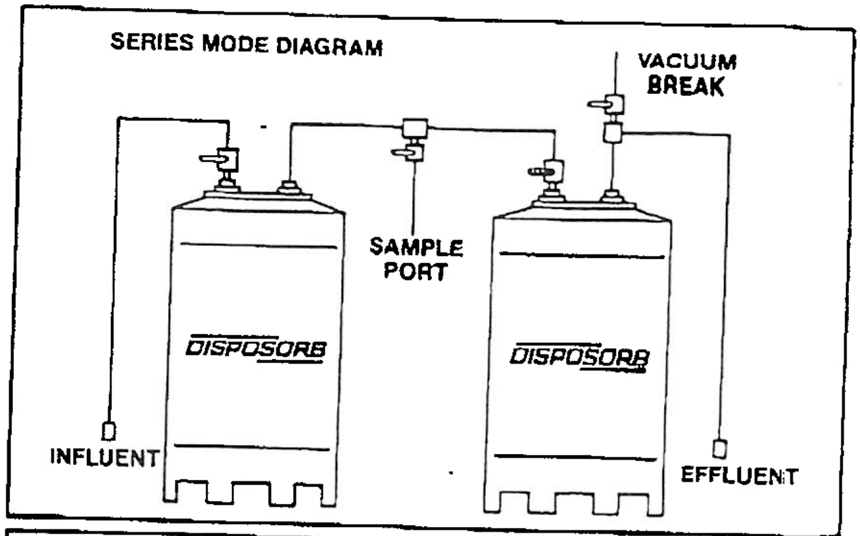
**The units can also be ordered with reactivated carbon providing an economical solution for wastewater applications. Reactivated carbon units are not for potable or food grade use.*

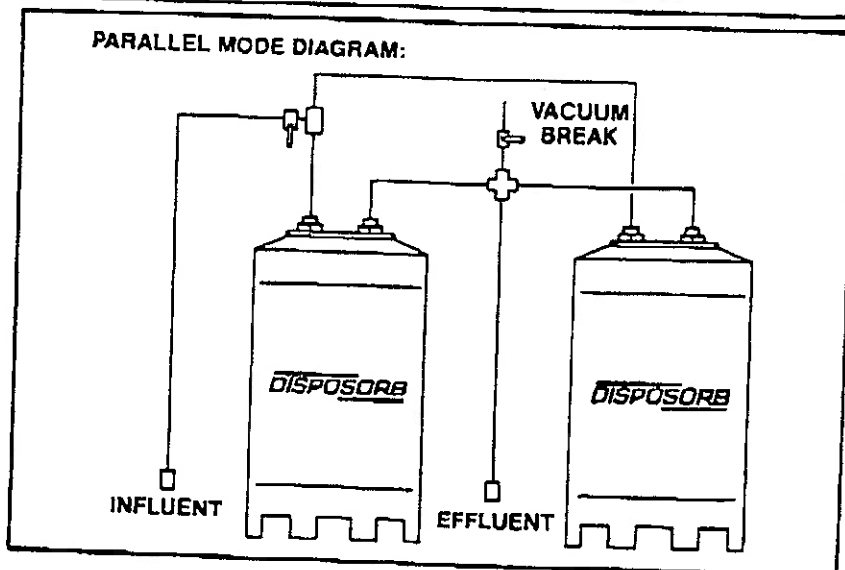
HOW TO ENSURE EFFICIENT UTILIZATION OF DISPOSORB

Generally, prefiltration will be necessary if the stream entering the DISPOSORB has more than 50 ppm of suspended solids. However, depending upon the nature of the suspended solids, prefiltration at lower suspended solids levels may be necessary. A flow of 30 gpm will provide 10 minutes contact time per 350 gallon DISPOSORB unit. Flow in the 350 gallon DISPOSORB unit should not exceed 30 gpm for an individual unit or create an operating pressure of >7.5 psig in single, series or parallel operation. This pressure rating may limit the maximum flow attainable in applications using multiple DISPOSORBS in series operation. A flow of 10 gpm will provide 5 minutes contact time per 55 gallon DISPOSORB unit. Flow in the 55 gallon DISPOSORB unit should not exceed 10 gpm for an individual unit, or create an operating pressure of >7.5 psig in single, series or parallel operation.



DISPOSORB units can be moved easily to treatment site.





Contact time and organic removal efficiency can be enhanced by using multiple DISPOSORB units in parallel or series mode operation. Depending upon the specific application, consideration should be given to using a vacuum-break or anti-siphon loop to ensure the DISPOSORB is flooded, and that a vacuum cannot be applied to it.

Monitoring the influent to the final DISPOSORB in series mode is a good precaution against effluent breakthrough.

350 gallon DISPOSORB units 44″ diameter by 67″ high may be prepared for operation using hose connections or hard pipe. Connections are male 1½″ NPT inlet and outlet. Calgon Carbon has available hose harnesses for this purpose as optional equipment. The *white* connection is the *inlet* for *downflow* operation. The outlet is grey. The DISPOSORB is not recommended for upflow operation.

55 gallon DISPOSORB units 23″ diameter by 36″ high may be prepared for operation using hose connections or hard pipe. Connections are ¾″ NPT inlet and 1″ NPT outlet.

DISPOSORB units are not designed for operation under high pressure or vacuum. The units have been tested under pressure and should not be operated at a pressure above 7.5 psig.

Granular activated carbon must be thoroughly wetted before use to dispel air and to assure proper contact with the influent stream. To facilitate use in the field Calgon Carbon has performed the wetting procedure prior to shipment. Before placing the DISPOSORB unit into service, fill the unit through the effluent line. The DISPOSORB is now ready for use in the normal operating mode.

DISPOSAL

Depending upon what materials are adsorbed on the carbon, the storage, transportation and disposal of the spent carbon may be subject to federal, state and local regulations as a hazardous material.

TRANSPORTING ADSORBER MATERIALS

DISPOSORB adsorber units may be easily moved by sling or forklift.

Shipping weight for the 350 gallon DISPOSORB units containing granular activated carbon is approximately 2500 pounds. Spent units can be expected to weigh about 2500 pounds after water is drained via siphon on the effluent line or 1 psi air pressure connected to the influent line.

For 350 gallon DISPOSORB units which contain Klensorb 100, shipping weight is approximately 2800 pounds.

Shipping weight for the 55 gallon DISPOSORB units containing granular activated carbon is approximately 350 pounds. Spent units can be expected to weigh approximately 350 pounds after water drain.

For 55 gallon DISPOSORB units which contain Klensorb 100, shipping weight is approximately 400 pounds.

PRECAUTIONS

Wet activated carbon preferentially removes oxygen from air. In closed or partially closed containers and vessels, oxygen depletion may reach hazardous levels. If workers are to enter a vessel containing carbon, appropriate sampling and work procedures for potentially low-oxygen spaces should be followed, including all applicable federal and state requirements.

WARRANTY

There are no warranties either expressed or implied or any warranty of merchantability or fitness for a particular purpose associated with the sale of this product.

For information regarding incidents involving human and environmental exposure, call (412) 787-6700 and ask for the Regulatory and Trade Affairs Department.

For further information, phone (412) 787-6700, or contact:
Calgon Carbon Corporation, P.O. Box 717, Pittsburgh, PA 15230-0717

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Appendix C: Historic Plant Sewer Map