SIMON HYDRO-SEARCH

March 18, 1993
(350115013)

175 N. Corporate Drive
Suite 100
Brookfield, WI 53045

Telephone (414)792-1282
Facsimile (414)792-1310

Mr. Tom Wentland
Wisconsin Dept. of Natural Resources
Southeast District Office
P.O. Box 12436
Milwaukee, WI 53212

RE: Remedial Design/Remedial Action Work Plan, Interim Remedial Measures, Sta-Rite Industries, Inc., Delavan, Wisconsin

Dear Mr. Wentland:

Our previous correspondence with the Wisconsin Department of Natural Resources (WDNR) dated March 10, 1992 described the process by which remedial action would be accelerated at the Sta-Rite Industries, Inc. (Sta-Rite) facility. Since WDNR approval of the interim remedial measures (IRM) process, the following activities have been completed:

- Additional source characterization activities were completed in accordance with addenda to the project plans approved by WDNR;
- Technical Memoranda #1 through #4 were submitted by Simon Hydro-Search and approved by WDNR without significant comment;
- The Focused Feasibility Study was completed recommending implementation of soil vapor and ground-water extraction systems and was subsequently approved by WDNR; and
- A public notice was published announcing the proposed interim remedial measure and no comments were received by WDNR from the public.

Simon Hydro-Search is pleased to submit this Work Plan on behalf of Sta-Rite to proceed with remedy implementation. Attached to this Work Plan are the requisite project organization and schedule as well as the Remedial Design/Remedial Action (RD/RA) Project Plans.

As shown on the attached project organization (Figure 1), implementation of the soil vapor and ground-water extraction systems will be contracted directly by Sta-Rite with assistance by selected contractors. To the extent practical, existing resources within Sta-Rite's manufacturing operations in Delavan will be utilized for construction. Subcontractors will be utilized for installation of soil vapor vents and ground-water extraction wells, trenching activities, and related construction tasks requiring specialized equipment. Sta-Rite possesses resources internally for piping assembly, electrical connections, ground-water extraction pump, and blower installation. Construction documentation will be performed by Simon

Hydro-Search and provided to WDNR for review and approval following initial system start-up and operational testing.

Initiation of the construction of the IRM will commence within 30 days of WDNR approval of this Work Plan and RD/RA Project Plans. Major construction work elements and their projected duration are shown on the attached schedule (Figure 2). Construction is expected to be completed within 20 weeks of WDNR approval subject to the availability of subcontractors, materials, and equipment. WDNR will continue to be advised of construction progress through the required monthly progress reports.

The remedial design is also transmitted herein which addresses design considerations, specifications for all equipment and materials, design drawings, and performance expectations. In order to assess the system performance, a Monitoring Program Plan is proposed as well as plans for its continued operation and maintenance. The existing Health and Safety Plan and is also modified herein to take into consideration activities beyond those which were necessary to complete the remedial investigation. No modifications to the existing Quality Assurance Project Plan are necessary, and it is hereby incorporated into these plans by reference.

We look forward to your favorable review and approval of the RD/RA Project Plans so that Sta-Rite can proceed with remedy implementation at the earliest possible date. Please do not hesitate to contact us if questions should arise during your review.

Sincerely,

SIMON HYDRO-SEARCH

Daniel L. Morgan for

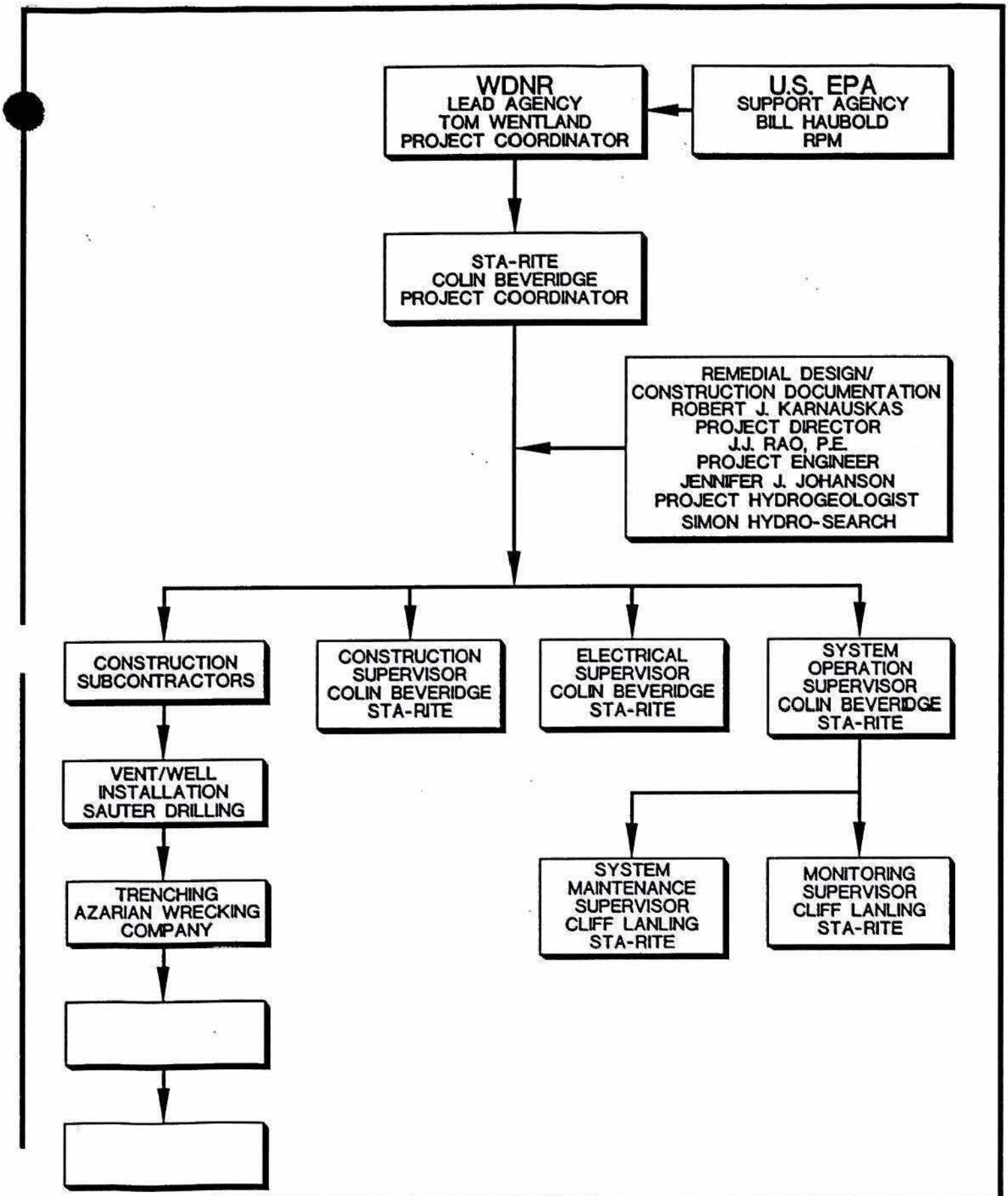
Robert J. Karnauskas, P.G., P.HG.
Director of Hydrogeology

Jennifer J. Johanson
Hydrogeologist

J. J. Rao
Director of Engineering

RJK/JJR/JJJ:jo
enclosures

cc: Colin Beverage, Sta-Rite Industries
Ray Krueger, Michael, Best & Friedrich
Mark Giesfeld, WDNR-Madison (3 copies)



SIMON HYDRO-SEARCH
Brookfield Lakes Corporate Center X
175 N. Corporate Drive, Suite 100
Brookfield, Wisconsin 53045

RD/RA PROJECT ORGANIZATION

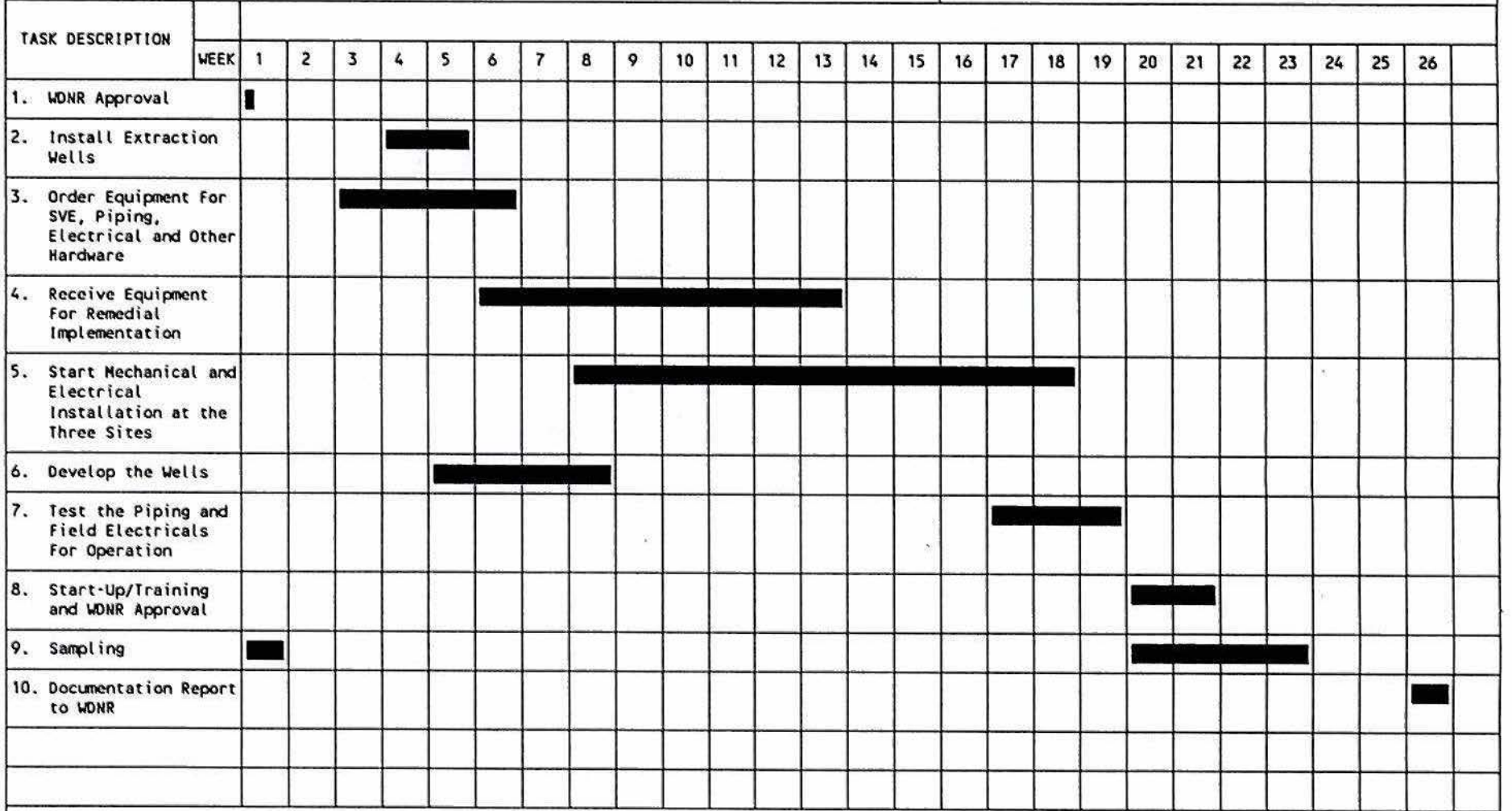
/hsi/15013/flow-diagram/rdra-orgchart

FIGURE: RD/RA WP 1

WORK SCHEDULE

PROJECT SCHEDULE

PROJECT: Sta-Rite, Delavan, Wisconsin
PREPARED BY: J.J. Rao, Simon Hydro-Search
PREPARED FOR: Sta-Rite Industries, Inc.



COMMENTS:

Figure 2

SIMON HYDRO-SEARCH

SIMON HYDRO-SEARCH

175 N. Corporate Drive
Suite 100
Brookfield, WI 53045

Telephone (414)792-1282
Facsimile (414)792-1310

REMEDIAL DESIGN / REMEDIAL ACTION PROJECT PLANS INTERIM REMEDIAL MEASURE STA-RITE INDUSTRIES, INC.

March 18, 1993

Prepared For:

Sta-Rite Industries, Inc.
293 Wright Street,
Delavan, Wisconsin 53115

Prepared By:

Simon Hydro-Search
Brookfield Lakes Corporate Center XII
175 N. Corporate Drive, Suite 100
Brookfield, Wisconsin 53045

Project No.: 350115013

Michael R. Noel, Vice President
Manager, Milwaukee Operations

J. J. Rao
Director of Engineering

Robert J. Karnauskas, P.G., P.HG.
Director of Hydrogeology

Jennifer J. Johanson
Project Hydrogeologist

SIMON Environmental

TABLE OF CONTENTS

TABLE OF CONTENTS (CONT'D.)

TABLE OF CONTENTS (CONT'D.)

FIGURES

TABLE OF CONTENTS (CONT'D.)

FIGURES (CONT'D.)

TABLES

APPENDICES

DRAWINGS

1.0 INTRODUCTION

Trichloroethylene (TCE) and its derivatives have been identified as residual soil contaminants at the Sta-Rite Industries, Inc. (Sta-Rite) Delavan facility. Three soil source areas were verified during RI activities, and are targeted for remediation. These three sites are:

- The existing SVE area adjacent to Plant #2,
- The Plant #2 southeast source area, located near the back truck dock area of Plant #2, and
- The former chip storage area and nearby solvent release area (former chip storage source area) located southeast of Plant #1.

Tetrachloroethylene (PCE) and 1,1,1-trichloroethane (TCA) are also present at one or more of these residual source areas.

Simon Hydro-Search carried out soil vapor extraction (SVE) and soil vapor extraction/ground-water extraction (SVE/GWE) pilot tests at these three sites on July 16 and 17, 1992. The results of these pilot tests were submitted as Appendix M of Volume II of II of the Technical Memoranda Report Appendices, Remedial Investigation/ Feasibility Study (RI/FS), Sta-Rite Industries, Inc., Delavan, Wisconsin (TM/Report Appendices).

Based on the SVE/GWE pilot test results, a conceptual remedial design (RD) was prepared and discussed with Sta-Rite personnel. Several visits were made to the site to discuss the implementation of this conceptual RD as an interim remedial measure (IRM) for the residual impacts to soil.

The RD for all three sites are specifically planned with flexibility to isolate any one site for independent observation. The vacuum is applied from a central SVE unit located near the

southeastern corner of Plant #2 with three independent vacuum header pipes for these sites. Extracted ground water from the six deep wells at the Plant #1 source area and four deep wells at the Plant #2 southeast source area shall be conveyed in two separate headers for discharge into an 8" storm drain adjacent to the main storm water main along the southern end of Plant #2 with an east to west discharge direction.

Ground-water extracted from the 10 deep wells to be installed at two of the three sites shall be discharged to a storm water sewer in accordance with a Wisconsin Pollutant Discharge Elimination System (WPDES) permit. The soil vapors to be extracted under the influence of vacuum shall be discharged to the ambient air as the total anticipated discharge of the contaminants is well under the limit of 5.7 lbs/hr of total volatile organic compounds (VOCs).

The number of shallow SVE wells and the number of deep SVE/GWE wells were determined based on the pilot test data. A shallow soil gas radius of influence (ROI) of 10 feet for Plant #1 and 15 feet for Plant #2 and deep soil gas ROI of 25 feet for both Plants #1 and #2 were calculated. These ROI were used to determine well spacing over the area of residual soil impacts. The impacted areas were estimated based on soil gas survey contour maps which are submitted as Appendix A.

The SVE unit is rated at 500 scfm, 13.5" Hg maximum vacuum with a 50 hp motor with a drive belt for a positive displacement Roots blower. The SVE unit is intrinsically safe with NEMA #7 electrical controls, a condensate tank, an automatic condensate drain pump, level switches, temperature indicator, and a switch for automatic shutdown in addition to the necessary filters, vacuum, and pressure gauges mounted for convenient sampling as per Wisconsin Department of Natural Resources (WDNR) regulations.

2.0 DESIGN DEVELOPMENT

The design of the IRM was developed after conducting vacuum extraction tests on the soil vapors at the three source areas and observing the influence of vacuum on soil vapors and on ground-water flow into the extraction wells installed in the saturated zone.

The ROI were calculated for each site and this provided the basis to design a SVE/GWE system. The pilot test method, actual field observations, and detailed calculations were submitted as Appendix M of the TM/Report Appendices.

2.1 Radius of Influence

Two geologic layers are present in the unsaturated zone at the Sta-Rite Facility. The upper layer is a silty sand till unit, and the lower layer is a sand and gravel outwash unit with a variable silt and clay content. The soil vapor ROI estimated from the pilot tests for the two geologic layers were as follows:

LOCATION	ROI UPPER SILTY SAND TILL	ROI LOWER SILTY SAND AND GRAVEL OUTWASH
Plant #1	10 Feet	25 Feet
Plant #2 Southeast Source Area	15 Feet	25 Feet
Plant #2 Former Sump Area	20 Feet*	--

*Surface air leaks obscured the results to a certain extent but the range of ROI calculated was 10 feet to 28 feet. Existing observation points were used at this location, and may have been screened across both geologic units, so the ROI variation may relate to the geology.

Based on these ROI and the soil gas survey, which delineated the approximate area of soil gas impacts, the remedial design for installation of the shallow and the deep extraction wells was established as shown on Figures 2-1, 2-2 and 2-3 for Plant #1, Plant #2 Southeast Source Area and Plant #2, Former Sump Area respectively. These figures describe the first step of the design development work.

The design of the proposed SVE/GWE system at the three remediation sites may be summarized as below:

- Plant #1: Twenty-three SVE vents in the vadose zone, approximately 28 feet deep and six SVE/GWE wells, approximately 45 to 55 feet deep.

- Plant #2: Southeast Source Area: Six SVE vents in the vadose zone, approximately 28 feet deep, and four SVE/GWE wells approximately 45 to 55 feet deep.

- Plant #2: Former Sump Area: Four SVE vents in the vadose zone. Two SVE vents of 2-inch diameter currently in use will be connected to the SVE unit. Two more SVE vents of 4-inch diameter shall be installed up to 28-foot depth.

The development of proposed SVE/GWE system involving extraction of contaminant vapors in the vadose zone and the extraction of contaminated ground water at enhanced rate under the influence of vacuum is discussed below:

2.2 Interpretation of SVE Results

The details of the SVE pilot tests have been submitted in the Focused Feasibility Study (FFS) and also as Appendix M, TM/Report Appendices. These SVE results are

summarized in Tables 2-1 and 2-2. These data shall be referred to in the interpretation for design development.

2.2.1 Contaminant Removal Rate

The pilot test results in Table 2-2 indicate that when vacuum is applied at a rate of 100 scfm and at a level of 9" Hg, the contaminant removal rate in the vapor phase was up to 0.13 lbs/hour. The contaminated ground water was recovered at a 50% higher rate under vacuum than under ambient conditions (12 gallons per minute (gpm) versus 8 gpm respectively).

Assuming 100 scfm air flow, it is then considered possible to remove total volatile organic compounds (VOCs) amounting to more than 1,100 lbs per year at the rate of 0.13 lbs/hour and at least 175 lbs/year at the lowest calculated extraction rate of 0.02 lbs/hour.

The pilot test results must be interpreted in light of the fact that vacuum extraction was carried out for a short duration. If the same level of vacuum extraction is sustained over a prolonged period of time (one week to several months), the SVE/GWE system would achieve a dynamic balance. This may be further examined by taking into consideration the operation of a vacuum-inducing mechanical unit.

There are three types of vacuum-inducing mechanical units which are amenable to SVE/GWE extraction technology. These are:

- Regenerative blowers,
- Centrifugal blowers, and
- Positive displacement blowers.

2.2.2 Selection and Influence of Vacuum Extraction Unit

The regenerative blowers, when connected to the extraction wells, shall induce vacuum which is usually at a lower level than the other two units mentioned above. As the available contaminant vapors and/or water vapor at the site conditions become sparse in concentration, the level of vacuum will increase slightly but the regenerative blower will approach its maximum vacuum level quickly. This is due to the fact that a regenerative blower is designed to have a low friction condition and allow ambient air to slip around the fan blades without creating additional vacuum at the suction or an electrical overload on the motor. As the remediation progresses, the regenerative blowers are therefore much less efficient and least useful in vacuum extraction technology over a prolonged period of time.

The centrifugal blowers, either single stage of multi-stage, usually offer a higher degree of vacuum at the suction side than the regenerative blowers. The extraction rates offered by these blowers are variable over a range shown by the performance curve that correlates the volumetric flow rate to the induced vacuum. The lower the level of vacuum, the higher is the air flow rate and vice-versa. Therefore, in remediation by vacuum extraction, as the contaminant quantity around the extraction well decreases, the extraction flow rates gradually decrease causing the level of vacuum applied to increase. This phenomenon can then be assumed to progress to the maximum rated capacity of the centrifugal blower offering a lower extraction flow rate with elapsed time while achieving higher levels of vacuum. Though a reduction in flow rate is a disadvantage, it offers safety for smooth operation of the blower without breakdown and an apparent increase in vapor phase concentration of the contaminant.

In case of a positive displacement (PD) blower, the unit is designed to provide a constant suction flow rate. In its application to vacuum extraction technology, it becomes apparent that initially when the contaminant concentration is high and/or site conditions allow vaporization of the contaminant readily, the suction conditions of the blower are satisfied by application of low or moderate levels of vacuum. Assuming there are no surface air leaks, the flow rate of the contaminant vapors in the induced air flow will tend to decrease.

This will automatically induce higher vacuum conditions which expand the available flow rate to satisfy the PD blower. This phenomenon is used to automatically achieve the maximum designed vacuum level. Any further difficulty in inducing the fixed flow rate then causes the vacuum relief valve to open and admit atmospheric air. Such a condition is easily noticeable and can be corrected, when necessary.

The PD blowers offer the highest levels of vacuum for a given energy input among all the three blowers and a high degree of vacuum of 9" Hg or more is obtainable with reasonable physical size of the blower.

At the three Sta-Rite remediation sites, the soil grain size analyses show P200 content (silt and clay fraction) to be about 20%. Consequently, the available porosity is low and a high resistance to air flow in the vadose zone is expected. A PD blower is, therefore, highly desirable as compared to the other two types of blowers to achieve high levels of vacuum. The PD blower could apply vacuum of 9" Hg at the initial stages and is designed to provide a much higher level of vacuum of about 10.5" Hg as the interim remediation progresses with time. This should assure long-term performance of the system, based on the pilot test data.

2.2.3 Volumetric Flow Rate

The total quantity of the contaminant removed at the remedial site is dependent on two major factors:

- the concentration of the contaminant in the exhausted vapors and the extracted ground water, and

- the rate at which the vapor stream or the contaminated ground water is discharged.

The concentration of the contaminant for a given removal rate of a specific contaminant will depend of the total volumetric flow rate of air/ground water. It is uneconomical and not

necessarily desirable to have a high air flow rate. Moreover, the higher the flow rate, the lower the maximum achievable vacuum per unit horsepower of applied energy. Higher level of vacuum is also critical in increasing ground-water flow above the natural conditions.

The Plant #1 site has the maximum number of wells which have been integrated into three main vacuum headers. Plant #2 has a total of ten vapor extraction wells at the new (southeast) site while there are four wells at the Former Sump Area. The design of a common SVE unit was intended to provide an accelerated remedial action to each of the three sites by applying vacuum to only one site at a time.

Once the initial mass of the contaminant is removed, it is considered probable that the common unit may have sufficient capability to remediate all three sites simultaneously. This may be verified as the design features allow isolation of each of the three sites.

At Plant #2 there are four shallow SVE wells at the former sump area and a total of ten SVE and SVE/GWE extraction wells at the southeast source area. Plant #1 has a total of 29 extraction wells connected to three main vacuum headers. The three sites therefore allow vacuum extraction of ten wells at a time or less as per the piping design. A study of the available PD blowers offered on SVE units without requesting a highly customized design indicate that 500 scfm is the upper end of the SVE units without exceeding 50 hp motor size or sacrificing the vacuum level to less than 9" Hg for field installation. The 50 hp motor size also enables Sta-Rite to provide up to 100 amp, 450 V, and 3-phase power supply to run the SVE unit without undue delay or requiring new electrical power supply arrangements.

The 500 scfm flow rate, if applied to Plant #1 above, may remove in excess of 1,100 lbs of total VOCs per year based on the pilot test results of 0.13 lbs/hour for 100 scfm. Even if the contaminant removal rate is assumed to be 20% of this projected value, a removal of 200 lbs/year from one area is considered to be significant. Combining all the three sites for remediation at 500 scfm rate may yield similar contaminant removal rates with progression

of time. This is theorized as the concentration from each site may decrease but the total removal rate may still be augmented by combined extraction rate for the three sites.

2.3 Interpretation of Ground-Water Extraction Results

The intent of ground-water extraction is twofold; first to optimize the performance of the SVE system by maintaining or increasing the depth to water, thereby increasing the area available for SVE, and second to remove impacted ground water at the source, thereby decreasing the remediation time required.

Pilot test results indicated SVE vents become clogged with fine soil particles through ground-water transport, and the application of vacuum to the pilot extraction points caused a mounding of ground water within the vent, thus decreasing the area available for applying vacuum to the vadose zone. The combination of mounding and siltation severely reduced the effectiveness of the initial SVE pilot tests performed at the site. The second SVE pilot testing utilized ground-water extraction to keep ground water at or below static water levels, and this resulted in vastly improved SVE effectiveness.

The existing ground-water extraction wells, EX-1 through EX-7, pump at a rate ranging from 60 to 100 gpm. However, the existing extraction wells are located along the western side of the facility, where the P200 content is lower, and therefore, the hydraulic conductivity of soils in the sand and gravel aquifer is approximately an order of magnitude higher than along the eastern side of the facility, at the newly confirmed source areas. Consequently, the anticipated ground-water extraction rate for the system described herein is approximately an order of magnitude lower than that of existing extraction wells.

The rate of ground water removal at the proposed extraction wells was estimated prior to SVE pilot testing. Approximately 8 gpm could be removed without causing the extraction well to draw down below the pump intake. During the pilot test, however, the effect of applied vacuum was to increase the sustainable yield such that a flow rate of 12 gpm could be maintained. The pilot testing did not indicate whether this increase in removal rate

could be maintained over a longer period of time, or if the effect of the vacuum only applies in the initial days of extraction. Therefore, the ground-water extraction rates have been estimated for flow rates ranging from 6 to 12 gpm. This range is not great enough to cause a problem in pump sizing, so the pumps chosen for the new ground-water extraction system are sized such that the low and high ends of this range are within the pump capabilities.

2.4 Projected Levels of Contaminant Removal

The levels of contaminant removal may be projected based on an assumed concentration of total VOCs in the vapor phase and an assumed concentration in the extracted ground water. The concentration assumptions are related to the SVE results.

2.4.1 Projected VOCs Removed in Extracted Vapors

The PD blower will exhaust at a constant rate of 500 scfm. The total weight of air discharged at standard density of 0.075 lbs per scfm will be:

$$500 \times 0.075 = 37.5 \text{ lbs/minute}$$

or

$$37.5 \times 1{,}440 = 54{,}000 \text{ lbs/day}$$

The pilot test results show the concentration of total VOCs present in the exhaust vapors to contain up to about 300 parts per million (ppm) on a weight basis. Projected total VOC removal rates are shown below to illustrate quantitative contaminant removal at levels both lower and higher than observed in the pilot tests. As the remediation progresses, the rate of VOC removal may vary, and it is expected the total quantity removed per year will decrease. The sampling results will be monitored to assure compliance with the emission standards for the exhaust air. If VOC emissions indicate the emission standards may be exceeded, the system operation may require modification to maintain compliance. System modification may involve reduction of the number of wells connected to the SVE unit.

ASSUMED VOC CONCENTRATION, PPM BY WEIGHT OF AIR	PROJECTED VOCS REMOVAL RATE*	
	LBS/DAY	LBS/YEAR
10	0.54	197
20	1.08	394
50	2.70	985
75	4.05	1,478
100	5.4	1,971
150	8.1	2,956
200	10.8	3,942
300**	16.2	5,913
400	21.6	7,884
500	27.0	9,855

* None of the removal rates exceed 5.7 lbs/hr. total VOC stipulated by WDNR.
** Anticipated concentration based on pilot test results

2.4.2 Projected VOCs Removal in Extracted Ground Water

The review of the past site data shows a wide range of total VOC concentrations in the extracted ground water. A range of 50 to 10,000 parts per billion (ppb) has been selected as representative of the concentration of total VOCs in the site ground water. Using this range of concentrations and the range of estimated flow rates of 6 gpm to 12 gpm per well, the range of total VOCs removed from the site ground water is presented below.

ASSUMED VOC CONCENTRATION IN GROUND WATER (µg/l)	PROJECTED VOC REMOVAL RATE IN GROUND WATER			
	6 GPM		12 GPM	
	VOCS REMOVED PER WELL			
	LBS/DAY	LBS/YEAR	LBS/DAY	LBS/YEAR
50	0.0036	1.31	0.0071	2.62
100	0.0071	2.62	0.0144	5.25
200	0.0144	5.25	0.0288	10.51
500*	0.036	13.13	0.072	26.27
750	0.054	19.7	0.108	39.40
1,000	0.071	26.2	0.144	52.5
2,000	0.144	52.5	0.288	105.0
3,000	0.216	78.8	0.431	157.6
4,000	0.288	105.1	0.576	210.2
5,000	0.360	131.3	0.720	262.7
10,000**	0.719	262.7	1.439	525.4

* Anticipated concentrations based on ground-water samples collected from wells in Plant #6 southeast source area.

** Anticipated concentrations based on ground-water samples collected from wells in the former chip storage source area.

3.0 SPECIFICATIONS

The specifications for the SVE unit and the ground-water pumps are discussed separately.

3.1 Specifications for the SVE Unit

The SVE unit specified is manufactured by Air Components and Engineering, Inc., 939 Ken-O-Sha Industrial Drive, SE, Grand Rapids, Michigan, 49509, and sold by RCS Environmental Equipment, Mequon, Wisconsin. The SVE unit model # is SV-5000 rated for 500 cfm at 13.5" Hg vacuum with Roots #711URA1 positive displacement rotary lobe (blower) vacuum pump with 50 hp, 3-phase, 450 VAC, 1,750 rpm motor, Class I, NEMA 7 UL-approved with an 80 gallon condensate tank with level switch, automatic liquid drain pump, a dry in-line air filter, high temperature safety switch, and a non-resettable hour meter on the control panel. The unit is equipped with silencer, gages, sampling ports, vacuum connections, and miscellaneous accessories. The equipment shall allow any liquid slugs or condensed vapors to accumulate in the condensate tank and the motor shall shut down automatically if a high level is reached in the condensate tank. The automatic drain feature shall allow the condensed/contaminated ground water to be pumped to the storm water main as permitted under a Wisconsin Department of Natural Resources (WDNR) permit.

The equipment for applying vacuum and the piping are better described by reviewing the drawings prepared for the project with the bill of material (B/M). There are eight total drawings numbered Sheets 1 through 8. Sheet 0 provides the reference for each sheet number and its title. The list is as follows:

Sheet No.	Title
1	Isometric Piping Plant #1
2	Former Sump Area Isometric Piping Plant #2
3	Southeast Source Area Isometric Piping Plant #2
4	Well Construction and Header Details

Sheet No.	Title
5	Typical Connection Details
6	Manometer Connection Details
7	Site Layout Remediation Header Piping
8	Main Connections: Vacuum and Ground-Water Discharge

The number showing specific items on these drawings are listed in the B/M, Sheets 1 through 5. These specify a total of 61 items listed on the drawings and the ground-water pump. The drawings and the B/M are enclosed in Section 3.3.

3.2 Ground-Water Pump Specifications

Each of the ten deep wells to be installed shall be equipped with a centrifugal submersible ground-water discharge pump with adjustable flow rate. Such a typical pump shall be Sta-Rite pump Model #10P4D02T-02, size 4, and stage pump with 3,450 rpm, 0.75 hp motor rated at 12 gpm at 180' tdh or 2 gpm at 325' tdh. The pumps shall be installed with provision at the well head to measure discharge flow rate, measure water depth when the system is inoperative, and with a check valve/control valve combination in the discharge line for direct discharge into a pressurized underground discharge header. The arrangement at the well head and the control wiring shall permit shutdown/start-up of any ground-water pump as desired. Furthermore, a flanged connection to the vacuum header from the well head can be used for isolation of the pump and the well to enable any maintenance or repair without requiring the entire remedial system to be shutdown.

3.3 Drawings & Bill of Materials

The drawings of the site remediation system and the bill of materials are shown as Sheets 1 through 8. A central reference information sheet is included as Sheet 0.

4.0 MONITORING PROGRAM PLAN

4.1 Soil Vapor Monitoring Plan

The sampling of the soil vapors extracted by application of vacuum shall be done in accordance with the regulatory requirements of the state. The regulatory requirements, the sampling methodology, the proposed sampling equipment, and the analytical methods to obtain the results are explained below:

4.1.1 Regulatory Requirements

NR406.04(2)(c) of the Wisconsin Administrative Code limits the maximum amount of volatile organic compounds that can be emitted to the ambient air without an air pollution control permit to 5.7 pounds per hours. Proposed NR419.07(4)(b) will limit maximum emissions under any condition to 9 pounds per hour. Finally, benzene emissions are limited to 300 pounds per year by NR445. Emissions above this limit require a permit and installation of lowest achievable emission technology.

Even when an air management permit is unnecessary, WDNR requires completion of Form 4400-120, "Application to Treat or Dispose of Petroleum Contaminated Soil" for the SVE system.

4.1.2 Sampling Frequency and Schedule

The schedule for sampling of SVE system air emissions will be in accordance with proposed NR419.07(6) as follows:

- daily for the first three days of operation,
- weekly for the next three weeks, and
- monthly thereafter until completion of remediation.

Schedules will be adjusted accordingly to take into account time periods for shutdown due to extreme cold or excessive soil moisture levels. In addition, sampling will be arranged to coincide with opening and operation of new sections of the system.

4.1.3 Sampling Methodology and Equipment

This section describes methods for collection and laboratory analysis of SVE system air emissions. Method 1500 of the National Institute for Occupational Safety and Health (NIOSH) Manual of Analytical Methods, Third Edition provides the basis for procedures, equipment, and sampling parameters. Modifications, where necessary, shall be implemented.

Vapor Collection

Air samples of the SVE system exhaust shall be collected on 400 mg/200 mg charcoal tubes. The larger 400 mg/200 mg tubes shall be used in place of the standard 100 mg/50 mg tubes initially to provide the necessary absorption capacity needed for the wide range of compounds in the exhaust stream, reduce concern for breakthrough and resampling, and provide a larger analytical sample to reach lower limits of detection. The data obtained shall be used to reconsider the use of smaller tubes, if warranted.

The sampling flow rate shall be typically maintained at 200 cc per minute utilizing a battery-operated air sampler and low flow controller. Vapors shall be drawn through the sorbent tube by attaching flexible tubing from the sampling train to a sampling port fitted on the extraction system exhaust. A control valve shall be included in the sampling port fitted on the extraction system exhaust. A control valve shall be included in the sampling port fittings and opened only during sampling. A "T" connector shall be placed between the sorbent tubes and sampling port to allow release of excessive exhaust pressure created by the blower. Pressurization of the sampling system would cause a positive bias in the sampling results.

Sampling flow rates shall be determined and monitored with a rotameter on a regular basis. The calibration of the rotameter shall be checked using a film flow meter as a primary standard. Initially, sampling flow rates shall be checked before and after collection of each sample.

Sampling time frames will vary with the estimated concentration of vapors in the exhaust stream. The time shall typically range from 10 minutes to over half an hour per sample. To ensure breakthrough shall not occur, a preliminary analysis of VOC concentration in the exhaust stream shall be conducted using colormetric detector tubes. Based upon the detector tube results, sampling times or flow rates can be adjusted to prevent overloading of the charcoal sorbent tubes.

As part of the sampling program, various performance and operational characteristics of the SVE system will be monitored and recorded. The following system operating parameters will be measured during each sampling event:

- air flow rate in cubic feet per minute,
- air temperature (inlet to and exhaust from blower), and
- vacuum (at inlet to blower).

Vacuum will be measured with a Dwyer slack tube manometer or a vacuum gage. Air temperature will be measured with a standard thermometer or temperature indicator mounted integrally in the exhaust piping.

Operational measures made during sampling will be recorded on the sampling data sheets (Appendix D).

4.1.4. Sample Analysis

Analysis will be via gas chromatography as described in NIOSH Method 1500. Due to the larger charcoal tubes used, the amount of carbon disulfide used for desorption of the

analytes may be increased accordingly. Samples submitted to the laboratory will include field blanks. Blanks shall be handled and analyzed in an identical manner as samples. The results of blanks are subtracted from the sample results prior to calculating the presented concentration.

Samples shall be analyzed for TCE, TCA, PCE and total VOCs. Laboratory reports will indicate micrograms of each recovered, detection limit and airborne concentrations in parts per million. Analysis will be conducted by laboratories accredited by the American Industrial Hygiene Association and certified by the State of Wisconsin.

4.2 Ground-Water Monitoring Plan

Performance monitoring will be required following installation of the interim remediation system. This monitoring entails hydraulic monitoring and water quality monitoring of monitor wells, extraction wells, and effluent waters as necessary to evaluate the performance of the ground water extraction system in controlling and removing documented ground-water impacts. The monitoring plan is described below. Monitoring locations, frequencies, and parameters are presented in Tables 4-1 and 4-2.

4.2.1 Ground-Water Monitoring

Ground-water monitoring activities include collecting water quality and hydraulic data from select shallow and deep monitor wells and the proposed extraction wells (Figure 4-1). The monitoring program will include selected wells in both upper and lower portions of the unconsolidated aquifer, and will include monitor wells in and near the source areas and the plume margins. These data will be collected prior to system start-up to provide a baseline for subsequent data evaluation, during system operation as part of ongoing monitoring, and following successful attainment of clean up to monitor continued compliance. Certain monitoring locations which are more critical for evaluation of system performance will be monitored quarterly; less critical locations will be monitored annually (Tables 4-1, 4-2).

4.2.2 Hydraulic

The hydraulic effect of the new and existing extraction systems will be monitored using the potentiometric data from surrounding monitor wells. Water level data will be collected from each monitor well and extraction well sampled during each sampling event. These water level data will be plotted on a map and compared to water level information collected prior to the new extraction system operation, and to predicted drawdown based on pilot test data to evaluate the hydraulic influence of the extraction wells.

4.2.3 Water Quality

Temporal changes in the water quality in the extracted water at the source areas and the surrounding impacted plumes will be monitored by collecting and analyzing selected ground water samples. The intent of the monitoring plan is to provide a representative selection of wells at the source areas, within the plume, and near the current plume margins to evaluate temporal changes in the plume configuration and concentration. A summary of sampling locations, frequencies and parameters is presented in Tables 4-1 and 4-2.

In the initial sampling round prior to system start-up, samples will be collected from all the wells listed in Table 4-1 and will be analyzed for VOCs using United States Environmental Protection Agency Method 502.2, as well as field parameters, including temperature, pH, specific conductivity, color, odor, and appearance. These analyses should provide a baseline against which to compare previous and subsequent sampling results. Using this initial data baseline water quality maps will be prepared showing the extent of TCE, TCA, and PCE. A baseline water-table map will also be prepared from the initial sampling data. Samples will then be collected quarterly from the monitor wells indicated on Table 4-1 and analyzed for TCE, TCA, PCE and field parameters. Once every year, a complete VOCs analysis will also be included. Sampling the extraction wells and the extraction system discharge will be performed quarterly in conjunction with monitor well sampling as required by the WPDES permit. After the first year of operation and subsequently every two years, the accumulated analytical data will be evaluated to determine whether the sampling plan should be revised

502.2 Parameters on following page

EPA Method 502.2 Parameters:

Detection Limit: 0.5 ug/l (ppb), unless otherwise noted below in ( )

Benzene
Bromobenzene
Bromodichloromethane
Bromoform
Bromomethane
Carbon tetrachloride
Chlorobenzene
Chloroethane
Chloroform
Chloromethane
o-Chlorotoluene
p-Chlorotoluene
Dibromomethane
Dibromochloromethane
1,2-Dibromo-3-Chloropropane
(5.0)
o-Dichlorobenzene
m-Dichlorobenzene
p-Dichlorobenzene
1,1-Dichloroethane
1,2-Dichloroethane
1,1-Dichloroethylene
1,2-Dichloroethylene, cis
1,2-Dichloroethylene, trans
Dichloromethane
(1.0)
1,2-Dichloropropane
1,3-Dichloropropane
1,1-Dichloropropene
2,2-Dichloropropane
1,3-Dichloropropene
Ethylbenzene
Ethylene Dibromide
(5.0)
Styrene
1,1,1,2-Tetrachloroethane
1,1,2,2-Tetrachloroethane
Tetrachloroethylene
Toluene
1,1,1-Trichloroethane
1,1,2-Trichloroethane
Trichloroethylene
1,2,3-Trichloropropane
Vinyl Chloride (0.3)
o-Xylene
Xylenes, meta & para

to more efficiently monitor the impacted plume by modifying the number and/or location of sampling points and/or sampling parameters. It is anticipated that removal of the source areas via SVE and extraction of ground water at previously uncontrolled sources should decrease the plume extent. Therefore, monitor wells at the current plume margin will become non-impacted, and no longer be effective monitor points.

4.2.4 Discharge Water Monitoring

The extraction well system effluent quality will be monitored to confirm compliance with the WPDES permit. Sampling frequency and water quality monitoring parameters will be dictated by the requirements in the WPDES permit. No modification to the existing WPDES permit will be required if the total concentration of VOCs discharged to the storm sewer does not significantly increase while operating the extraction system. The flow rate of extracted water will be monitored via manual flow rate measurements from each of the existing extraction wells (EX-1 through EX-7) and from the combined flows of extraction wells at each new SVE/GWE system. Flow rate monitoring, in conjunction with water quality monitoring, will be used to confirm the amount of VOCs discharged to the storm sewer system. Monitoring and sampling will occur at system start-up, and quarterly during system operation, or as required by the WPDES permit. The monitoring frequency and parameters to be analyzed are presented in Table 4-2.

WPDES PERMIT FOLLOWS THIS SECTION

4.2.5 Closure/Post-Shutdown Monitoring

Ground-water monitoring activities will be continued following successful completion of remediation to assure aquifer quality remains within an acceptable range. The monitoring program will include the same wells utilized on the most current approved monitoring plan. The schedule for collecting samples is summarized below.

State of Wisconsin \ DEPARTMENT OF NATURAL RESOURCES

Carroll D. Besadny
Secretary

Box 12436
Milwaukee, Wisconsin 53212

MASTER FILE COPY
PROJECT # 3501150 13
CC: JJJ(2)

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

IN REPLY REFER TO: 3420

Mr. Richard La Chapell, Plant Manager
Sta-Rite Industries, Inc.
293 South Wrigth Street
Delavan, WI 53115

SUBJECT: WPDES Permit No. WI-0055816-3

Dear Mr. La Chapell:

Your application for reissuance of a Wisconsin Pollutant Discharge Elimination System (WPDES) permit has been processed by this Department. The conditions of the attached permit Number WI-0055816-3, were determined using the permit application, information from your company's permit file, comments received during the public notice period, Wisconsin Administrative Codes NR 200, NR 203, NR 205, NR 105, NR 106.

The attached WPDES permit covers the discharge from the facility located at 293 S. Wright Street, Delavan, Wisconsin into a tributary of Swan Creek in Walworth County, Wisconsin. All discharges from this facility and actions or reports relating thereto shall be in accordance with the terms and conditions of this permit.

In accordance with this permit, discharge monitoring report forms are required to be submitted by you to the Department on a periodic basis. Blank copies of these reports and forms and instructions for completing them will be mailed to you under separate cover within sixty days.

The Department has the authority under Chapters.147 and 160, Wisconsin Statutes, to establish effluent limitations, monitoring requirements, and other permit conditions for discharges to groundwater and surface waters of the State. The Department also has the authority to issue, reissue, modify, suspend or revoke WPDES permits under Chapter 147, Wisconsin Statutes. Wis. Adm. Code Chapters NR 200, NR 203, NR 205, NR 105, and NR 106 have been adopted by the Department pursuant to this statutory authority.

To challenge the reasonableness of or necessity for any term or condition of the attached permit, Section 147.20, Wis. Stats., and Chapter NR 203, Wis. Adm. Code require that you file a verified petition for review with the Secretary of the Department of Natural Resources within 60 days of the date of this letter.

Richard La Chapell, Sta Rite Inc., WI-0055816-3

This notice is provided pursuant to Section 227.48, Wis. Stats., as renumbered by 1985 Wisconsin Act 182.

Sincerely,

Ronald Kazmierczak
Assistant District Director

Dated October 3, 1990

Enclosures

cc: SEWRPC
U.S. Environmental Protection Agency
Bureau of Wastwater

Permit No. WI-0055816-3

PERMIT TO DISCHARGE UNDER THE
WISCONSIN POLLUTANT DISCHARGE ELIMINATION SYSTEM

In compliance with the provisions of Chapter 147, Wisconsin Statutes,

Sta-Rite Industries Inc.

is permitted to discharge from a facility located at

293 S. Wright Street
Delavan, Wisconsin 53115

to a tributary of Swan Creek via storm sewer in Walworth County

in accordance with the effluent limitations, monitoring requirements and other conditions set forth in this permit.

This permit shall become effective on the date of signature.

This permit to discharge shall expire at midnight, July 31, 1995.

The permittee shall not discharge after the date of expiration. If the permittee wishes to continue to discharge after this expiration date an application shall be filed for reissuance of this permit in accordance with the requirements of Chapter NR 200, Wis. Adm. Code, at least 180 days prior to this expiration date.

State of Wisconsin Department of Natural Resources
For the Secretary

By Ronald Kazmierczak

Ronald Kazmierczak
Assistant District Director

Dated October 3, 1990

SPECIAL CONDITIONS

A. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

(1) During the period beginning on the date of signature and lasting until July 31, 1995, the permittee is authorized to discharge from outfall serial number 001, noncontact cooling water from air compressors, pump test water, and extraction wells.

(2) This discharge shall be limited and monitored by the permittee as specified below.

(a) There shall be no discharge of floating solids or visible foam in other than trace amounts.

(b) Samples taken in compliance with the monitoring requirements specified below shall be taken at the following location at outfall 001, after discharge to the storm sewer:

	DAILY EFFLUENT LIMITATIONS					MONITORING REQUIREMENTS	
	Quantity-kg/day (lbs/day)			Other Limitations (Specify Units)		Sample	Sample
EFFLUENT CHARACTERISTIC	Average	Maximum	Minimum	Average	Maximum	Frequency	Type
Flow - (GPD)						Monthly	Estimate
Temperature					89 F.	Monthly	Grab
Tetrachloroethylene					(2)	Monthly	Grab(1)
Trichloroethylene					(2)	Monthly	Grab(1)
1,1,1-Trichloroethane					(2)	Monthly	Grab(1)
Vinyl Chloride					(2)	Monthly	Grab(1)
Chloroethane					(2)	Monthly	Grab(1)

(1) Samples taken at 001 shall be collected under dry weather conditions, defined as 24 to 48 hours after a rainfall event capable of producing surface runoff.

(2) No limits for these materials are included in this permit at this time. This will be effective as long as all wells remain active as when the evaluation for NR 106 and 106 was completed for this facility. In the event that any extraction wells are removed from service, these limitations will be reevaluated and new limitations may be imposed based on the results of a review of the impact of the removal. A request for removal of the well must be submitted to the Department, prior to discontinuation of the discharge.

SPECIAL CONDITIONS

B. MONITORING REQUIREMENTS FOR GROUNDWATER MONITORING WELLS

During the period beginning on the date of signature and lasting until July 31, 1995, the permittee shall monitor each of the groundwater wells for parameters as specified below in Table 1. The permittee shall also meet the groundwater quality standards listed below for each well or group of wells.

a. The monitoring requirements listed below (in Table 1) apply to the following wells: TW-4, D-5, D-24, D-25, D-15, and D-18.

TABLE 1

GROUNDWATER QUALITY STANDARDS	MONITORING REQUIREMENTS	
	Sample Frequency	Sample Type (4)(5)
Groundwater Elevation (feet, MSL)	(1)	(3)
Depth to Groundwater (feet)	(1)	(2)
Tetrachloroethylene	(1)	Grab
Trichloroethylene	(1)	Grab
1,1,1-Trichloroethylene	(1)	Grab
Vinyl Chloride	(1)	Grab

(1) Monitoring shall be conducted quarterly with the results to be submitted at the frequency specified in Part I, C.1.b.

(2) Depth to groundwater shall be reported in feet, to the nearest 0.01 foot, below the top of the well casing. A report must be on file with the Department stating the pipe top elevation in feet above mean sea level (MSL), to the nearest 0.01 foot, for each groundwater monitoring well.

(3) Groundwater elevation shall be calculated by subtracting the depth to groundwater measurement from the pipe top elevation and be reported in feet above mean sea level to the nearest 0.01 foot.

(4) Grab samples shall be taken of the groundwater only after adequate removal or purging of standing water within the well casing has been performed. For those wells which will refill with water as fast as the water can be removed by bailing or pumping, four well volumes must be removed prior to sample collection and analysis. For those wells which will not refill with water as fast as the water can be removed by bailing or pumping, the existing volume of water inside the well casing must be removed and samples collected after the well has refilled to at least half the original volume in the well.

SPECIAL CONDITIONS

C. OTHER SPECIAL CONDITIONS

1. Reporting

a. Monitoring reports and reports required by Sections 8, 17, 20, 21 and 23 of Part II of this permit shall be signed by a principle executive officer, a ranking elected official, or other duly authorized representative.

b. Monitoring results obtained during the previous 3 months shall be summarized and reported on Discharge Monitoring Report Forms postmarked no later than the 15th day of the month following the completed reporting period. The first report is due on the 15th of the month following the date of signature. Duplicate signed copies of these reports and of all other reports required herein shall be submitted to the:

Wisconsin Department of Natural Resources
Division of Environmental Protection (Permits)
Southeast District Headquarters
2300 Dr. Martin Luther King, Jr. Drive
P.O. Box 12436
Milwaukee, WI 53212

GENERAL CONDITIONS

Rev. 07/27/89
IWW

PART II

1. Duty to comply
The permittee shall comply with all conditions of the permit. Any permit noncompliance is a violation of the permit and is grounds for enforcement action, permit revocation or modification, or denial of a permit reissuance application.

2. Permit actions
As provided in s. 147.03, Stats., after notice and opportunity for a hearing the permit may be modified or revoked and reissued for cause. If the permittee files a request for a permit modification, revocation or reissuance, or a notification of planned changes or anticipated noncompliance, this action by itself does not relieve the permittee of any permit condition.

3. Property rights
The permit does not convey any property rights of any sort, or any exclusive privilege. The permit does not authorize any injury or damage to private property or any invasion of personal rights, or any infringement of federal, state or local laws or regulations.

4. Inspection and entry
The permittee shall allow an authorized representative of the Department, upon the presentation of credentials, to:

a. Enter upon the permittee's premises where a regulated facility or activity is located or conducted, or where records are required under the conditions of the permit;

b. Have access to and copy, at reasonable times, any records that are required under the conditions of the permit;

c. Inspect at reasonable times any facilities, equipment (including monitoring and control equipment), practices or operations regulated or required under the permit; and

d. Sample or monitor at reasonable times, for the purposes of assuring permit compliance, any substances or parameters at any location.

5. Recording of results
For each effluent measurement or sample taken, the permittee shall record the following information.

a. The date, exact place, method and time of sampling or measurements;
b. The individual who performed the sampling or measurements;
c. The date the analysis was performed;
d. The individual who performed the analysis;
e. The analytical techniques or methods used; and
f. The results of the analysis.

6. Records of results
The permittee shall retain records of all monitoring information, including all calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation, copies of all reports required by the permit, and records of all data used to complete the application for the permit for a period of at least 3 years from the date of the sample, measurement, report or application. The Department may request that this period be extended by issuing a public notice to modify the permit to extend this period.

7. Signatory requirement
All applications, reports or information submitted to the Department shall be signed for a corporation by a responsible corporate officer including a president, secretary, treasurer, vice president or manager; and for a municipality by a ranking elected official; or other person authorized by one of the above and who has responsibility for the overall operation of the facility or activity regulated by the permit. The representative shall certify that the information was gathered and prepared under his or her supervision and based on inquiry of the people directly under his or her supervision that, to the best of his or her knowledge, the information is true, accurate and complete.

8. Compliance schedules
Reports of compliance or noncompliance with interim and final requirements contained in any compliance schedule of the permit shall be submitted in writing within 14 days after the schedule date, except that progress reports shall be submitted in writing on or before each schedule date for each report. Any report of noncompliance shall include the cause of noncompliance, a description of remedial actions taken and an estimate of the effect of the noncompliance on the permittee's ability to meet the remaining schedule dates.

9. Transfers
A permit is not transferable to any person except after notice to the Department. In the event of a transfer of control of a permitted facility, the prospective owner or operator shall file a new permit application and shall file a stipulation of permit acceptance with the Department WPDES permit section. The Department may require modification or revocation and reissuance of the permit to change the name of the permittee and to reflect the requirements of ch. 147, Stats.

10. Proper operation and maintenance
The permittee shall at all times properly operate and maintain all facilities and systems of treatment and control which are installed or used by the permittee to achieve compliance with the conditions of the permit. The wastewater treatment facility shall be under the direct supervision of a state certified operator as required in s. NR 108.06(2). Proper operation and maintenance includes effective performance, adequate funding, adequate operator staffing and training as required in ch. NR 114 and adequate laboratory and process controls, including appropriate quality assurance procedures. This provision requires the operation of back-up or auxiliary facilities or similar systems only when necessary to achieve compliance with the conditions of the permit.

11. Duty to mitigate
The permittee shall take all reasonable steps to minimize or prevent any adverse impact on the waters of the state resulting from noncompliance with the permit.

12. Duty to provide information
The permittee shall furnish the Department, within a reasonable time, any information which the Department may request to determine whether cause exists for modifying, revoking or reissuing the permit or to determine compliance with the permit. The permittee shall also furnish the Department, upon request, copies of records required to be kept by the permittee.

13. Sampling procedures
Samples and measurements taken for the purpose of monitoring shall be representative of the volume and nature of the monitored discharge and shall be taken at points specified in the permit using sample types specified in the permit and the following procedures:

a. For effluent flow measurement and sample collection - ch. NR 218.
b. For groundwater sample collection and analysis - ch. NR 214.

14. Test procedures
Monitoring shall be conducted according to test procedures listed in ch. NR 219, or any other test procedures specified in the permit.

15. Additional monitoring
If a permittee monitors any pollutant more frequently than required by the permit, using test procedures specified in ch. NR 219, the results of that monitoring shall be recorded and reported in accordance with this chapter. Results of this additional monitoring shall be included in the calculation and reporting of the data submitted in the DMR.

16. Monitoring reports
The monitoring results shall be reported at the intervals specified in the permit. Monitoring results shall be summarized on forms designated by the Department.

17. Noncompliance notification
a. The permittee shall report the following types of noncompliance by a telephone call to the Department's district office within 24 hours after becoming aware of the noncompliance.

(i) Any noncompliance which may endanger health or the environment.
(ii) Any violation of an effluent limitation resulting from an unanticipated bypass.
(iii) Any violation of an effluent limitation resulting from an upset.
(iv) Any violation of a maximum daily discharge limitation for those pollutants specifically designated in the permit to be reported within 24 hours.

b. A written report describing the noncompliance reported in condition 17, part a. shall be submitted to the Department's district office within 5 days after the permittee becoming aware of the noncompliance. The Department may waive the written report on a case-by-case basis based on the oral report received within 24 hours. The written report shall contain a description of the noncompliance and its cause; the period of noncompliance, including exact dates and times; the steps taken or planned to reduce, eliminate and prevent reoccurrence of the noncompliance; and if the noncompliance has not been corrected, the length of time it is expected to continue.

c. Reports of all noncompliance not required to be reported under condition 8 or condition 17, parts a. and b. shall be submitted with the monitoring reports required under conditions 16. The reports shall contain all the information listed in condition 17, part b.

18. Removed substances
Solids, sludges, filter backwash or other pollutants removed from or resulting from treatment or control of wastewaters or intake waters shall be stored and disposed of in a manner to prevent any pollutant from the materials from entering the waters of the state. Land disposal of treatment plant solids and sludges shall be at a site or operation licensed by the Department under ch. NR 180 or 181, or in accordance with ch. NR 214.

19. Spill reporting
The permittee shall notify the Department in accordance with ch. NR 158, in the event that a spill or accidental release of any material or substance results in the discharge of pollutants to the waters of the state at a rate or concentration greater than the effluent limitations established in the permit, or the spill or accidental release of the material is unregulated in the permit, unless the spill or release of pollutants has been reported to the Department under condition 17.

20. Planned changes
In accordance with ss. 147.02(4)(b) and 147.14(1), Stats., the permittee shall report to the Department any facility expansion, production increase or process modifications which will result in new, different or increased discharges of pollutants. The report shall either be a new permit application or if the new discharge will not violate the effluent limitations of the permit, a written notice of the new, different or increased discharge. The notice shall contain a description of the new activities, an estimate of the new, different or increased discharge of pollutants and a description of the effect of the new or increased discharge on existing waste treatment facilities. Following receipt of this report, the Department may modify the permit to specify and limit any pollutants not previously regulated in the permit.

Note: The notification should be directed to the Industrial Wastewater Section.

21. Increased discharge of toxic pollutants

a. 'Routine or frequent increase'. The permittee shall notify the Department in writing as soon as it knows or has reason to believe that any activity has occurred or will occur which would result, on a routine or frequent basis, in the discharge of any toxic pollutant which is not limited in the permit, if that discharge exceeds the highest of the following levels.

(i) One hundred micrograms per liter (100 ug/l);

(ii) Two hundred micrograms per liter (200 ug/l) for acrolein and acrylonitrile; five hundred micrograms per liter (500 ug/l) for 2,4-dinitrophenol and for 2-methyl-4,6-dinitrophenol; and one milligram per liter (1 mg/l) for antimony;

(iii) Five times the maximum concentration value reported for that pollutant in the permit application; or

(iv) A notification level greater than the level in sections (i), (ii), or (iii), above which the Department has included as a special condition to the permit.

b. 'Nonroutine or infrequent increase'. The permittee shall notify the Department in writing as soon as it knows or has reason to believe that any activity has occurred or will occur which would result, on a nonroutine or infrequent basis, in any discharge of a toxic pollutant which is not limited in the permit, if that discharge will exceed the highest of the following levels.

(i) Five hundred micrograms per liter (500 ug/l);

(ii) One milligram per liter (1 mg/l) for antimony;

(iii) Ten times the maximum concentration value reported for that pollutant in the permit application; or

(iv) A notification level greater than the level in sections (i), (ii), or (iii), above which the Department has included as a special condition to the permit.

22. Duty to halt or reduce activity
Upon failure or impairment of treatment facility operation, the permittee shall, to the extent necessary to maintain compliance with its permit, curtail production or wastewater discharges or both until the treatment facility operations are restored or an alternative method of treatment is provided.

23. Bypass
The permittee may bypass waste treatment facilities if this is necessary for the essential maintenance of the facilities and if the bypass does not exceed permit effluent limitations. The permittee may also bypass if the bypass is due to runoff in excess of the 10 year, 24 hours rainfall event and the bypass is designated as a specific discharge point in the WPDES permit. All other bypasses of waste treatment facilities, including diversion of wastewater from land disposal systems to surface waters, are prohibited unless the following conditions are met:

a. The bypass is necessary to prevent loss of life, personal injury or severe property damage;

b. There are no feasible alternatives to the bypass, such as the use of auxiliary treatment facilities, retention of untreated wastes or maintenance during normal periods of equipment downtime; and

c. The permittee submitted written notice 10 days before the date of the bypass and the Department's district office wastewater supervisor had approved the bypass in writing prior to its occurrence; or

d. In the event of an unanticipated bypass, the permittee notified the Department verbally within 24 hours and in writing within 5 days of each unanticipated bypass.

Briefing Memo

Sta-Rite Incorporated
293 S.Wright Street
Delavan, Wisconsin 53115

WPDES Permit No. WI-0055816-3

Background:

Sta-Rite Incorporated manufactures pumps and pumping equipment at the Delavan plant. Wastewater produced from noncontact cooling water at compressors and heat exchangers and pump testing is discharged into a storm sewer that discharges to Swan Creek ,in Walworth county, approximately one mile downstream of the plant.

Sta-rite is also discharging contaminated groundwater. The contaminated groundwater is the result of of cleaning and painting solvent discharges in past years onto the Sta-rite plant property. Trichloroethylene(TCE), and 1,1,1 trichloroethane(TCA) have been detected in the groundwater under the property. Sta-rite has installed a number of recovery wells to pump out the contaminated water and discharge it into the storm sewer.

Subsequent to the Sta Rite discharges, TCE was detected in the City of Delavan's water supply well number 4. The Department of Natural Resources has ordered the City of Delavan to eliminate the compounds from the well. The site of the well has also been designated a potential Superfund site, subject to remedial action to eliminate the source of the contamination. The State of Wisconsin has not formally accepted the lead agency role in the clean-up plans, nor has the US EPA done so. However, the Delavan Well #4 site will be placed on the list for future Super Fund clean-up. Any actions taken under NR 214 for groundwater clean up may be superceded by future Superfund remedial actions. Any actions taken to abate the problem at well #4 will be included in an agreement between the Department and Starite through a remedial action plan proposal.

In the past permit issuance, no limit was placed on the concentration of the contaminants allowed in the discharge because codes NR 105 and 106 of the Wisconsin Administrative Code had not been promulgated. In this reissuance, limits for TCE and TCA and breakdown products will not be placed in the permit since the provisions of NR 105 have been evaluated and the levels of contamination found were not in concentrations considerded toxic under NR 105.

A priority pollutant scan of the combined effluent detected no compounds other than TCE and TCA in the effluent. However, since tetrachloroethylene, vinyl chloride, and chloroethane may be present in the groundwater as breakdown products of TCE and TCA, monitoring will be retained for these compounds in the surface discharge and groundwater well samples.

Several separate sample points will be combined into one outfall for this permit reissuance. The sample points. 002,003, and 004 will be dropped. Outfall 001 will be defined as a sample of the total discharge into the storm sewer at the point after all extraction wells have discharged into the storm sewer in Wright street. Samples will be required of typical dry weather flow, after the effects of storm events have dissipated. This is usually one to two

days after a rain event of sufficient magnitude to result in runoff from the street into the storm sewer.

Proposed Limits:

Based on an evaluation of the applicability of the materials found in the priority pollutant scan and past monitoring at the facility no limits are required by NR 105 criteria. This will be the case as long as all the present wells are discharging at the same rates they have in the past. If any of the present extraction wells are removed from operation, the permit will be modified as needed to include limits for the following compounds, if necessary:

	Scan Result
1,1,1 Trichloroethane	0.060 mg/l
Trichloroethylene	0.060 mg/l
Tetrachloroethylene	0.001 mg/l(1)
Vinyl chloride	0.010 mg/l(1)
Chloroethane	0.001 mg/l(1)

(1) The level of detection is the limit available in the priority pollutant scan done for the permit application. These compounds were at less than the level of detection.

Continued monitoring is proposed at the ground water monitoring wells TW-4,D-5, D-24, D-15, D-18 for the following parameters:

1,1,1 Trichloroethane
Trichloroethylene
Tetrachloroethylene
Vinyl chloride
Chloroethane

This is included in the permit to evaluate the progress at extraction of the compounds and to maintain the data record of the quality of the groundwater until the Superfund remedial action plan is implemented.

Drafted by:

Gerald Jarmuz
SE District
Industrial Wastewater section

June 22, 1990

Final Operational Time Period

The interim SVE/GWE system will be operated in accordance with the design plans until a petition to cease operation of the system is approved by the WDNR. The petition to cease operation of the system will include documentation showing that the ground-water standards set forth in the ROD have been achieved and maintained for at least 12 months throughout the plume. During the 12-month period, ground-water samples will be collected on a quarterly basis and analyzed for TCE, TCA, PCE, and field parameters, with the addition of VOCs on the first and fourth quarterly samples.

Post-Shutdown Monitoring

Following approval of the petition to cease operation, a post-shutdown monitoring plan will be prepared to confirm that the VOC concentrations in the unconsolidated aquifer remain within acceptable limits. Wells will be monitored for the parameters of concern (TCE, TCA, PCE, DCE) during this post-shutdown period at a frequency and duration agreed upon by WDNR and Sta-Rite. The frequency and duration will be specified in the post-shutdown monitoring plan.

Reporting

During the IRM design and construction stage, the status of the project will be summarized monthly in a report to the WDNR in the same format as current monthly reporting. The monthly progress report will be submitted to WDNR by the tenth business day of each month.

During the period of remediation system operation, ground-water monitoring data and WPDES data will be submitted on a quarterly basis to the WDNR. Progress summary reports will be submitted to the WDNR annually during system operation and maintenance. The annual progress summary report will include the same information as found in the monthly progress reports and will include analytical data from ground-water and effluent

sampling summarized in the form of tables, figures, or other presentation methods, as appropriate, to assist in data interpretation. The annual summary will also contain a written interpretation of the data results, a discussion of system changes or modifications that were made or that are deemed necessary, and conclusions and recommendations on the system operation. After each two years of monitoring, the annual report will also contain recommendations for revisions to the monitoring proposed herein, as warranted, to continue to provide the most efficient, effective monitoring of the remedial system.

4.2.7 WPDES Monitoring

The analytical data collected from the extraction system discharge water will be submitted quarterly on a WDNR-supplied Discharge Monitoring Report as required by the WPDES permit. This data will be submitted until system closure, when discharge is no longer generated.

5.0 OPERATION AND MAINTENANCE

The operation and maintenance (O & M) plan for the proposed SVE/GWE system at the three sites is discussed below. The topics covered include the following:

- System Description
- Normal Operation and Maintenance
- Long-Term Maintenance and Problems
- Sampling and Record Keeping
- Contingency Plan

5.1 System Description

The RD for the three sites are described in Sheets 1 through 8 of drawing #1501. Sheet 0 lists the eight drawings by their titles and provides an easy reference to seek more specific design details. The three remediation sites shall be referred to in the text as follows:

- Former Sump Area, Plant #2,
- Southeast Source Area, Plant #2, and
- Plant #1.

These three remedial sites and the overall layout of the remedial equipment is shown schematically on Sheet 7. Sheet 7, titled "Site Layout Remediation Header Piping", may be used as a central reference drawing to understand the overall system description.

5.1.1 System Outline

The system essentially consists of two combined remedial methods applied to remove the contaminants from the vadose zone by application of vacuum to the shallow and deep extraction wells with slotted pipe in the vadose zone, and pumping of the contaminated

ground water recovered at enhanced rates in the deep wells from the saturated zones. Please review Sheets 1 through 8 to become familiar with the system's function design.

At the existing site termed "Former Sump Area - Plant #2," there shall be a total of four shallow wells. Two of these are existing 2" size wells and 2 more to be added shall be 4" size as shown isometrically on Sheet 2. No deep wells are included, as GWE is currently performed at that location by EX-7.

The Southeast Source Area - Plant #2 site has a total of six shallow wells and four deep wells, all of 4" size shown on Sheet 3.

The Plant #1 site shall have a total of 22 shallow wells and six deep wells also of 4" size shown isometrically on Sheet 1.

The remedial system pertaining to application of vacuum is described in Section 2.2 and the ground-water pumping/discharge is described in Section 2.3.

5.1.2 Soil Vapor Extraction Vacuum

There is one central vacuum system consisting of a Roots Model #711-URAI positive displacement blower with 50 hp, 1750 rpm motor with an adjustable belt drive rated for 500 scfm at 13.5 Hg maximum vacuum. The system also has an 80-gallon horizontal cylindrical tank with level switch for collection of condensate and is equipped with condensate drain pump with automatic start/stop controls. An hour meter on the control panel shall totalize and indicate the total hours of operation.

The entire SVE system has vacuum and pressure gauges, temperature indicating switch, coarse and fine particulate filter to protect the blower, and intrinsically safe NEMA #7 electrical wiring. The condensate tank has two vacuum connection inlet pipe headers of 6-inch diameter. The common exhaust from the blower is 6" in size after passing through a muffler.

There are all together three vacuum headers originating at the remedial sites and terminating at the central SVE unit location. These headers are 6", 4", and 4" in size for Plant #1, Plant #2 - Former Sump Area, and Plant #2 - Southeast Source Area, respectively. The two 4-inch size headers for Plant #2 sites are connected to a common 6" connection for hook-up to the central vacuum unit. However, each of the Plant #2 sites can be isolated from the other, if desired. The connections shown on Sheet 7 will allow the application of central vacuum in the following combinations:

- vacuum applied to all three sites through the two main connections,
- vacuum applied to any two of the three sites, and
- vacuum applied to any one of the three sites.

The flexibility designed shall allow remediation at accelerated pace for one site initially and/or extraction of maximum possible contaminant removal from all three sites if the conditions are conducive.

In addition to the choice of any one site for remediation by SVE, piping design shall permit easy isolation of any one particular well or a combination of wells by manipulation of the well head piping connections using blind flanges.

5.1.3 Ground-Water Pumping and Discharge

Each of the ten deep wells to be installed shall be equipped with a centrifugal submersible ground-water discharge pump with adjustable flow rate. Such a typical pump shall be Sta-Rite pump Model #10P4D02T-02, size 4, and stage pump with 3,450 rpm, 0.75 hp motor rated at 12 gpm at 180' tdh or 2 gpm at 325' tdh. The pumps shall be installed with provision at the well head to measure discharge flow rate, measure water depth when the system is inoperative, and with a check valve/control valve combination in the discharge line for direct discharge into a pressurized underground discharge header. The arrangement at the well head and the control wiring shall permit shutdown/start-up of any ground-water pump as desired. Furthermore, a flanged connection to the vacuum header from the well

head can be used for isolation of the pump and the well to enable any maintenance or repair without requiring the entire remedial system to be shutdown.

5.1.4 Application of Vacuum

The application of vacuum from the central SVE unit can be done to induce vacuum at all three sites through their individual headers or to any one site. The extent of the vacuum applied can also be varied, if necessary, by changing the speed of the belt drive and/or bleeding in atmospheric air if necessary.

The intent of normal operating procedure is to apply the maximum available vacuum to a given header and discharge the contaminant vapors extracted from the soil and/or ground water collected in the deep wells to the atmosphere within the allowable limits of WDNR.

The progression of the remediation at the three sites shall logically decrease the concentration of the contaminant(s) as well as the total quantity available for extraction per unit time. The design, therefore, allows possible application of gradually higher levels of vacuum in the long run to provide an effective remediation technique for SVE and SVE/GWE.

The system has been designed to permit sampling of soil vapors extracted at the suction and discharge side of the vacuum unit. It also permits measurement of actual air temperature at the sampling conditions to enable density corrections to the air sampled. The vacuum induced can be observed in the field at multiple observation points provided for connecting vacuum gages and/or random site sampling using field test kits.

The ground water being discharged can also be sampled conveniently at each wellhead or at the final discharge point prior to entering the main storm sewer. A water meter shall be installed in each of the two 3-inch ground-water discharge pipes to document the total volume of contaminated ground water disposed of.

The SVE unit shall be housed in a specially erected enclosure approximately 8.5' wide by 16' long with about an 8' ceiling allowing walk-in access for the operator, sampling equipment, maintenance access, and for supervisory personnel to make periodic inspections.

5.2 Normal Operation and Maintenance

The normal operation and maintenance of the entire system shall be the responsibility of Sta-Rite personnel who shall participate in the installation of the system and its start-up. These personnel shall be trained to conduct soil vapor sampling and routine maintenance.

5.2.1 Operational Tasks

The normal operation shall consist of the following tasks as the suggested requirements:

5.2.1.1 Daily Operational Tasks

- Verify the operation of the SVE unit at the central location and log the hour meter reading.
- Record the operating temperature, inlet vacuum, and discharge air pressure.
- Observe the vacuum connections to the main header(s) to be leak proof.
- Inspect the 8-inch storm drain for discharge of ground water from the new SVE/GWE wells, and estimate flow rate visually. Use a ladle-type sampling device to take a ground-water sample and note its color and odor.
- Inspect the running lights for the existing GWE wells to ensure their proper operation.

- Carry a portable U-manometer and/or vacuum gage with flexible tubing connector to make spot checks of the vacuum level at various points in the field.

After the daily inspection is made, consult the troubleshooting guide if any equipment abnormalities are noticed and/or consult a supervisor for more detailed logging of the data.

5.2.1.2 Weekly Operational Tasks

- Write down the total operational hours for a specific weekly interval and make sure there are no abnormal time gaps.

- Write down the water meter readings from the new SVE/GWE wells and record their weekly discharge volume.

- Measure the applied vacuum at any of the three sites under remediation at least once a week and record it.

- Check for any tell-tale signs at the equipment housing for lubrication requirement.

- Attach a portable manometer to measure the vacuum and the discharge pressure at the SVE unit using the standard pet cocks provided. This will assure that the observed gage readings are reliable. If necessary, replace the gages.

- Walk to all the three remedial sites for a weekly inspection to assure normal operation as judged visually and by the sound of the operating equipment.

5.2.1.3 Monthly Operational Tasks

- Use a multimeter and check the current drawn by the 50 hp motor and record it.

- Stop the blower and check the tension of the belt drive as well as the conditions of the belt.

- Turn the condensate pump on/off manually to check its operating status.

- Check the vapor discharge stack for any signs of corrosion and/or functionality while the system is fully operational.

- Check the condition of the vacuum hose and make sure there are no ground water puddles or particulate matter in abnormal quantities accumulating inside.

- Check the ground-water discharge temperature and record it. In winter, this may be done more frequently when temperatures are below freezing to assure the ground-water discharge conditions are satisfactory.

5.2.2 Maintenance Tasks

The following maintenance tasks are recommended on a monthly and quarterly basis:

5.2.2.1 Monthly Maintenance Tasks

- Shut down the SVE unit, disconnect the vacuum connections to the two vacuum headers, and carefully inspect for any debris, odor, and observe the condition of the equipment at the housing.

- Connect the vacuum hoses and restart the system. Observe any leaks or abnormal sounds of equipment operation as the system progresses to normal operating conditions.

- Inspect each of the ten new SVE/GWE well heads and the seven existing GWE wells. If necessary, connect a garden hose to the pump calibration/sampling connection. Run the ground water into a 5-gallon bucket determine the time required to fill to verify the pumping performance. Dispose the ground water immediately into the designated storm sewer.

- Verify the field electrical wiring at the Plant #1 and #2 power panels.

5.2.2.2 Quarterly Maintenance Tasks

- Stop the SVE unit and, using a bright light, inspect the belt drive, the inlet filters, and the condensate tank for water accumulation.

After restarting the system, measure the motor rpm, it's current draw, and log it in the record book.

5.3 Long-term Maintenance and Problems

Air Components and Engineering, Inc. of Grand Rapids, Michigan, who furnished the vacuum extraction unit, have provided a troubleshooting guide and this is enclosed as Appendix B.

5.3.1 Troubleshooting Guide

- See Appendix B.

- Review the operating log book and discuss any abnormalities with a special field inspection of the area concerned.

5.3.2 Equipment Handling

A maintenance report should be requested by the Sta-Rite Project Manager on a semi-annual basis preferably in spring and fall to review the winter and summer operating conditions, respectively. The review should then be used to meet the requirements for handling all of the remediation equipment problems and/or to implement improvements.

5.3.3 Long-Term Care Plans

An annual field inspection of all three sites and the central equipment housing should be conducted with the operation and maintenance personnel to verify the functionality of the equipment as installed and designed. The WDNR will be notified two weeks prior to the annual inspection.

Subsequently, any needs for replacement of parts based on malfunction or deterioration due to normal service or weathering effects of the field equipment should be identified. A deadline should be set to achieve the goals established and responsibilities delegated. A review should be conducted after the target dates to assure long-term care.

5.3.4 Inspection

A careful review of the daily, weekly, monthly, and quarterly logs should be conducted to verify operation and maintenance plans. Then, an inspection of this entire remedial system operation and/or specific areas of concern should be carried out as and when necessary.

5.4 Sampling and Recordkeeping

The recordkeeping plan essentially consists of logging the data obtained in the routine operational tasks, sampling as required by the approved monitoring plan and state regulations, and recording the results obtained.

5.4.1 Data Collection

The following forms are to be used for data collection as formatted by Sta-Rite Industries, Inc.

- Daily Operational Log (Appendix C),
- Weekly Operations Log (Appendix C), and
- Monthly Operational Log (Appendix C).

No format is specified for the Quarterly/Semi-Annual Report.

5.4.2 Sampling

The sampling shall be carried out as explained in Appendix C and in accordance with the most recent WDNR approved monitoring plan. The monitoring plan will include WPDES monitoring requirements.

5.4.3 Results

All the laboratory results shall be dated and filed for recordkeeping. A form to show the calculated contaminant discharge level is attached as part of Appendix C.

5.5 Contingency Plan

The system design involves minimal moving equipment and, as such, no emergencies are anticipated.

A contingency plan shall be in effect to repair or replace the following major items likely to cause failure of the remediation system.

Ground-Water Pumps:

- Non-functional ground-water pumps will be isolated and repaired or replaced.

Blower:

- Sta-Rite is capable of repairing or replacing a 50 hp, 1,750 rpm blower with local maintenance and repair facilities.

- The Roots blower may be replaced under the warranty period by Air Components and Engineering, Inc. at a short notice. It may be repaired or a new unit installed using the inventory of an identical or equivalent Roots blower stocked by the manufacturer as well as by Air Components and Engineering, Inc.

Any repairs or replacement of vacuum or ground-water piping involves routine supplies available from Milwaukee, Madison, Appleton, and Green Bay area suppliers. In addition, out-of-state supplies in the Rockford and Chicago areas provide ready access to such items.

The WDNR Project Manager will be notified in the system fails. Notification will include the reason for the breakdown, downtime, steps taken to ~~convert~~ correct the problem, and steps taken to prevent recurrence of the breakdown.

6.0 HEALTH AND SAFETY PLAN

6.1 General

Operation of the SVE/GWE system presents the potential for safety hazards under both normal operating conditions and upset or emergency situations. This section will address safety issues related to system operation and maintenance.

6.2 Mandatory Safety Related Equipment

The following equipment shall be maintained at or immediately available to the treatment system building:

- First aid kit (with CPR mask and latex gloves)
- Fire extinguishers
- Eye wash (may be portable type)
- Spill clean-up supplies (bucket, mops, squeegee, flow control socks, etc.)
- Emergency phone number list (posted permanently by phone)

6.3 General Safety Precautions

Several basic safety rules shall apply to all personnel working in and around the treatment system building/facilities:

- All personnel shall have appropriate training in performing their specific duties related to SVE/GWE system operations and maintenance and the hazards associated with O & M tasks.

- When working on/or near SVE/GWE system equipment, all personnel shall wear safety glasses with side shields. Shoes shall have slip resistance soles and

leather uppers. Steel-toed are preferred, but not mandatory. Tennis/athletic shoes are not allowed.

- All floors and walkways shall be kept clean and dry.

- Areas of the treatment facility shall be designated as non-smoking.

- All upset incidents, accidents and injuries shall be reported immediately to Sta-Rite representatives.

- All lifting shall be done in a safe manner to prevent musculoskeletal injury.

- Material Safety Data Sheets for any hazardous materials used at the SVE/GWE system facility must be maintained in a convenient, accessible location at the facility. A single file or binder with index is preferred.

- When carrying out any repairs and/or extended O & M procedures in remote areas, it is preferred that two persons be assigned. If only one person is available, a walkie-talkie should be carried and a co-worker at the plant should be assigned to monitor the field worker and lend assistance as necessary.

6.4 Safety During Upset Conditions

Upset conditions and emergencies may create safety concerns not typically encountered during routine O & M. This sections will address safety issues associated with upset conditions.

6.4.1 General

All situations that have caused or have the potential for personal injury or significant damage to equipment must be treated as potential emergency situations. Personnel on-site should reference Section 10.0 "Emergency Response/Contingency Plan" of the Sta-Rite RI/FS Health and Safety Plan (HASP). The HASP provides instruction for responding to several types of emergency situations including medical treatment, fires, weather related incidents and spills and leaks. Section 11.0 of the HASP describes the specifics of a spill containment program.

A copy of the HASP shall be maintained at the treatment facility for ready reference. Emergency phone numbers and a map of the route to the hospital are included in the HASP. Phone numbers will be updated as needed.

6.4.2 System Failures

Vacuum and Water Pipeline

A line leak in the vacuum and water pipeline would likely necessitate excavation for repair. Appendix D of the HASP describes precautions necessary during excavation. Also, Section 11.0 "Spill Containment Program" should be referenced in the event of significant spillage. During repair near or through roadways, provisions must be made for control of traffic and pedestrians. Barriers such as traffic cones and caution tape should be used.

SVE/GWE System

SVE/GWE system failure may result due to improper maintenance or power outage. SVE/GWE system failure safety concerns are primarily those associated with repair of the equipment. Attention to control of energies (electrical, pneumatic, etc.) through lockout/tag out is critical. Standard safety equipment required for entry to

the SVE/GWE system facility must be followed by all personnel including outside contractors. Only authorized and trained personnel shall be allowed to effect repairs.

Any situation which poses a significant risk to personnel or the facility should be reported immediately, nearby facilities alerted and personnel evacuated until the danger is eliminated. Under no circumstances should on-site personnel engage in firefighting beyond incipient fires.

Table 2-1. Sampling Conditions; Calculated Air Weight and Air Density

Vent ID (SV)	Sample #	Time Collected (24 hour)	Elapsed Time (min)	Flow Rate (cc/min)	Volume (l)	Temp. (°F)	P (H_2O)	Air Density (g/l)	Weight of Air (g)
1034	2	9:11-9:31	30	246.8	7.40	197	2.5"	0.974	7.22
1034	4	11:18-12:28	70	220-246.8	16.3	185	2.5"	0.993	16.22
2 & 4	6	16:04-16:34	30	178-246.9	6.39	180	2.5"	1.00	6.39
2014	8	13:11-14:31	80	157-246.8	16.2	190	2.5"	0.99	15.93
2014	9	14:41-15:11	30	167-246.8	6.21	188	2.5"	0.988	6.14

Table 2-2. Exhaust Air Vapor Concentrations

Location	Sample #	Total Weight Air Sampled (g)[1]	Laboratory Results (µg)[2]				Concentration (ppm)[3]				Discharge[4] (lb/hr.)			
			TCE	TCA	PCE	TOTAL (Sum)	TCE	TCA	PCE	TOTAL (Sum)	TCE	TCA	PCE	TOTAL (Sum)
SV-1034	2	7.217	147.2	122.4	16.7	286.3	20.4	17.0	2.3	40.0	0.009	0.008	0.001	0.02
SV-1034	4	16.22	420.1	345.3	5.6	771.0	25.9	21.3	2.9	50.1	0.012	0.010	0.001	0.02
SV/EX-2014	8	15.93	3902.3	646.0	3.7	4552.0	245.0	40.6	0.23	285.8	0.11	0.018	0.0001	0.13
SV/EX-2014	9	6.14	1459.6	237.9	ND	1697.5	237.7	38.7	0	276.4	0.107	0.017	0	0.12
SVES 2 & 4	6	6.39	271.2	ND	41.9	313.1	42.4	0	6.6	49.0	0.019	0.0	0.003	0.022

NOTES:
[1] See Table 4-1 for calculation of total weight of air volumes sampled
[2] Laboratory results from Swanson Environmental, Inc.
[3] ppm (rounded to nearest 0.1) calculated as µg/g air sampled
[4] at 100 scfm: (10,800 lb/day air) (1 day/24 hr.) x concentration = lb/hr.

TABLE 4-1. WELLS INCLUDED IN GROUND-WATER QUALITY MONITORING PLAN

WELL I.D.	REPORTED WELL DEPTH (FT. BELOW GROUND)	MONITORING FREQUENCY*	LOCATION/RATIONALE
PLANT #2			
SOUTHEAST SOURCE AREA:			
MW-2005	34.7	Quarterly	Monitor southern plume margin.
MW-2004	37	Annually	Monitor western plume margin (City Well #4 pumping).
D-18**	37	Quarterly	Monitor northwestern plume margin (City Well #4 non-pumping).
Southeast Extraction System	-50	Quarterly	Evaluate extraction system performance.
FORMER SUMP SOURCE AREA:			
D-15**	38	Quarterly	Monitor plume at source area.
P-2009	71	Annually	Monitor intermediate depth water quality at source area.
P-2010	90	Annually	Monitor water quality at depth at source area.
TW-3	48	Annually	Monitor downgradient plume magnitude.
TW-1	44	Quarterly	Monitor downgradient plume magnitude at western margin.
TW-1A	85	Annually	Monitor downgradient plume margin at depth.
EX-1***	44.2	Annually	Evaluate extraction system performance, monitor discharge to storm sewer.
EX-7***	37.64	Annually	Evaluate extraction system performance, monitor discharge to storm sewer.
PLANT #1			
MW-1026	42	Quarterly	Monitor plume downgradient of chip storage area.
MW-1027	40.6	Quarterly	Monitor plume downgradient of chip storage area.
TW-4**	49.5	Quarterly	Monitor plume downgradient of chip storage area.
D-5**	50	Quarterly	Monitor western downgradient plume margin.
D-25R**	35	Quarterly	Monitor western downgradient plume margin.
D-24R**	36	Quarterly	Monitor northern plume margin at water table.
D-27	75	Annually	Monitor northern plume margin at depth.
EX-2	43.29	Annually	Evaluate extraction system performance.
EX-3	43.9	Annually	Evaluate extraction system performance.
Chip Storage Extraction System	-50	Quarterly	Evaluate extraction system performance, monitor discharge to storm sewer.
OFF-SITE			
MW-1030	50.3	Annually	Evaluate changes in TCE concentration.
STORM SEWER DISCHARGE			
SS-1**	NA	Quarterly	Monitor discharge to storm sewer for WPDES Permit.

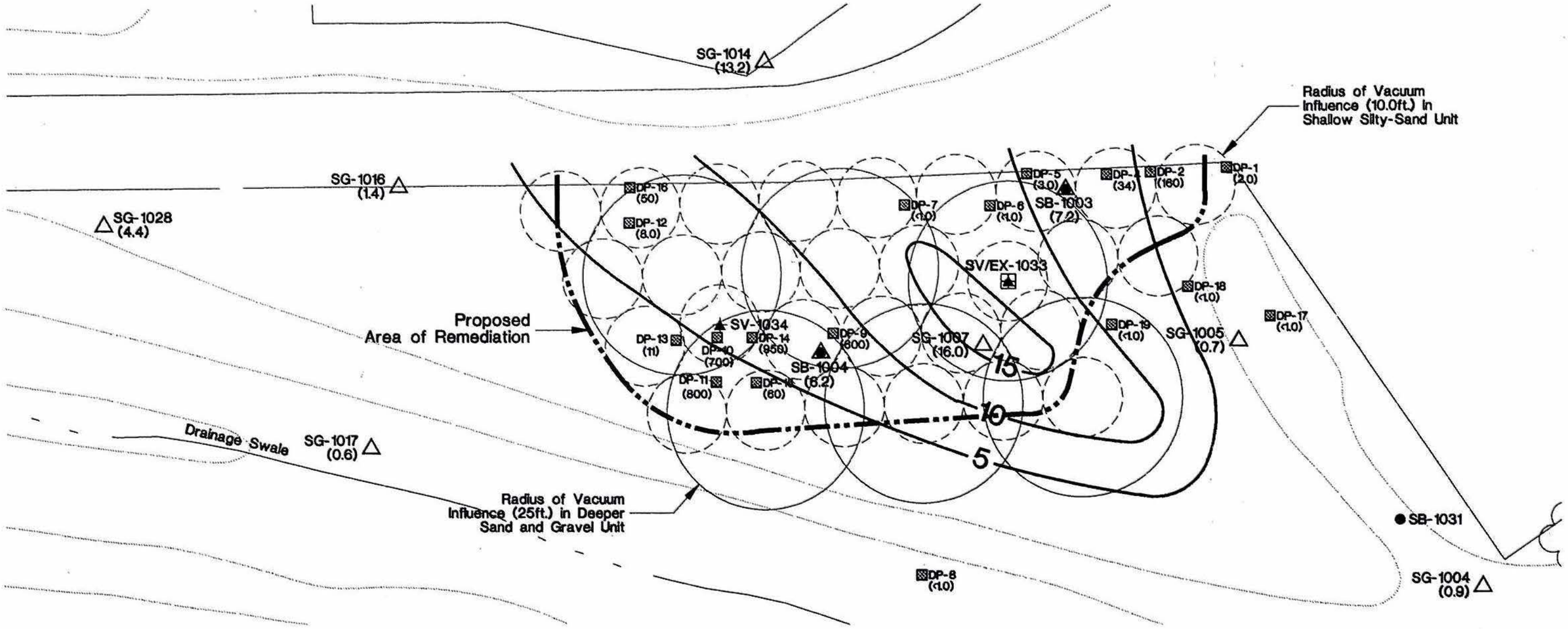
* = See Table 4-2 for parameters for wells at each frequency.
** = Monitored as part of WPDES permit.
*** = Measured depth.

TABLE 4-2. WATER QUALITY SAMPLING SCHEDULE

SAMPLE LOCATION*	SAMPLING FREQUENCY*	ANALYTICAL PARAMETERS											
		LABORATORY						FIELD					
		TCE	TCA	PCE	VINYL CHLORIDE**	CHLOROETHANE **	VOCs	TEMPERATURE	pH	SPECIFIC CONDUCTIVITY	APPEARANCE (COLOR, ODOR, TURBIDITY)	WATER LEVEL	FLOW RATE
PLANT #2													
Monitor Wells	Quarterly	X	X	X	X	X		X	X	X	X	X	
	Annually						X	X	X	X	X	X	
Extraction Wells	Quarterly	X	X	X	X	X		X	X	X	X		X
PLANT #1													
Monitor Wells	Quarterly	X	X		X	X		X	X	X	X	X	
	Annually						X	X	X	X	X	X	
Extraction Wells	Quarterly	X	X		X	X		X	X	X	X		X
OFF-SITE	Annually	X	X					X	X	X	X	X	
STORM SEWER DISCHARGE	Quarterly	X	X	X	X	X		X	X	X	X		

* See Table 4-1 for a list of wells to be sampled at each frequency.
** These parameters are only required for wells monitored as part of the WPDES permit.

Figure 4-1 shows sampling point locations.



EXPLANATION

● SB-1031	BOREHOLE LOCATION AND DESIGNATION
▲ SB-1004 (6.2)	BOREHOLE/SOIL GAS PROBE LOCATION, DESIGNATION AND PID READING (ppm)
△ SG-1004 (0.9)	SOIL GAS SAMPLING LOCATION, DESIGNATION AND PID READING (ppm)
⊞ SV/EX-1033	DUAL SOIL VAPOR/GROUND-WATER EXTRACTION WELL LOCATION AND DESIGNATION
✦ SV-1034	SOIL VAPOR EXTRACTION VENT LOCATION AND DESIGNATION
▨ DP-7	TEST PIT LOCATION, DESIGNATION AND HIGHEST PID READING OBSERVED (DONOHUE, 1984)
-5-	SOIL GAS SURVEY PID CONTOUR (ppm) Contour interval 5ppm, dashed where inferred

Base map from Aero-Metric Engineering, Inc., 4-16-88.

N

SCALE
0 50
Feet

Note: ppm in isobutylene equivalents

SIMON HYDRO-SEARCH
Brookfield Lakes Corporate Center XII
175 N. Corporate Drive, Suite 100
Brookfield, Wisconsin 53045

Dsgn. by: JJJ | Chk. by: [illegible] | Apprv. by: RJK

PROJECT: 350115013 | DATE: 02/10/93

STA-RITE INDUSTRIES, INC.
DELAVAN, WISCONSIN

PROPOSED PLANT #1 REMEDIATION SYSTEM LAYOUT

DRAWING: 1501-62b | FIGURE: 2-1

/hsi/15013/1501-62b

SG-2011
(0.0) △

△SG-2009
(0.8)

Radius of Vacuum
Influence (25ft.) in Deep
Sand & Gravel Unit

MW-2005

940

△SG-2004
(1.0)

△SG-2005
(0.4)

△SG-2006
(11.6)

SG-2007
(15.2) △

△ SG-2008
(12.5)

SV/EX-2014

SV-2013

15

10

5

△SG-2013
(0.5)

△SG-2014
(1.0)

△SG-2015
(1.4)

Radius of Vacuum
Influence (15.0ft.) in Shallow
Silty-Sand Unit

△SG-2016
(0.4)

Drainage Swale

EXPLANATION

△ SG-2008 (12.5)	SOIL GAS SAMPLING LOCATION, DESIGNATION AND PID READING (ppm)
SV/EX-2014	DUAL SOIL VAPOR/GROUND-WATER EXTRACTION WELL LOCATION AND DESIGNATION
SV-2013	SOIL VAPOR EXTRACTION VENT LOCATION AND DESIGNATION
MW-2005	MONITOR WELL LOCATION AND DESIGNATION
—5—	SOIL GAS SURVEY PID CONTOUR (ppm) contour interval 5ppm

Note: ppm in isobutylene equivalents

N

SCALE
0 50
Feet

Base map from Aero-Metric Engineering, 4-16-88.

SIMON HYDRO-SEARCH
Brookfield Lakes Corporate Center XII
175 N. Corporate Drive, Suite 100
Brookfield, Wisconsin 53045

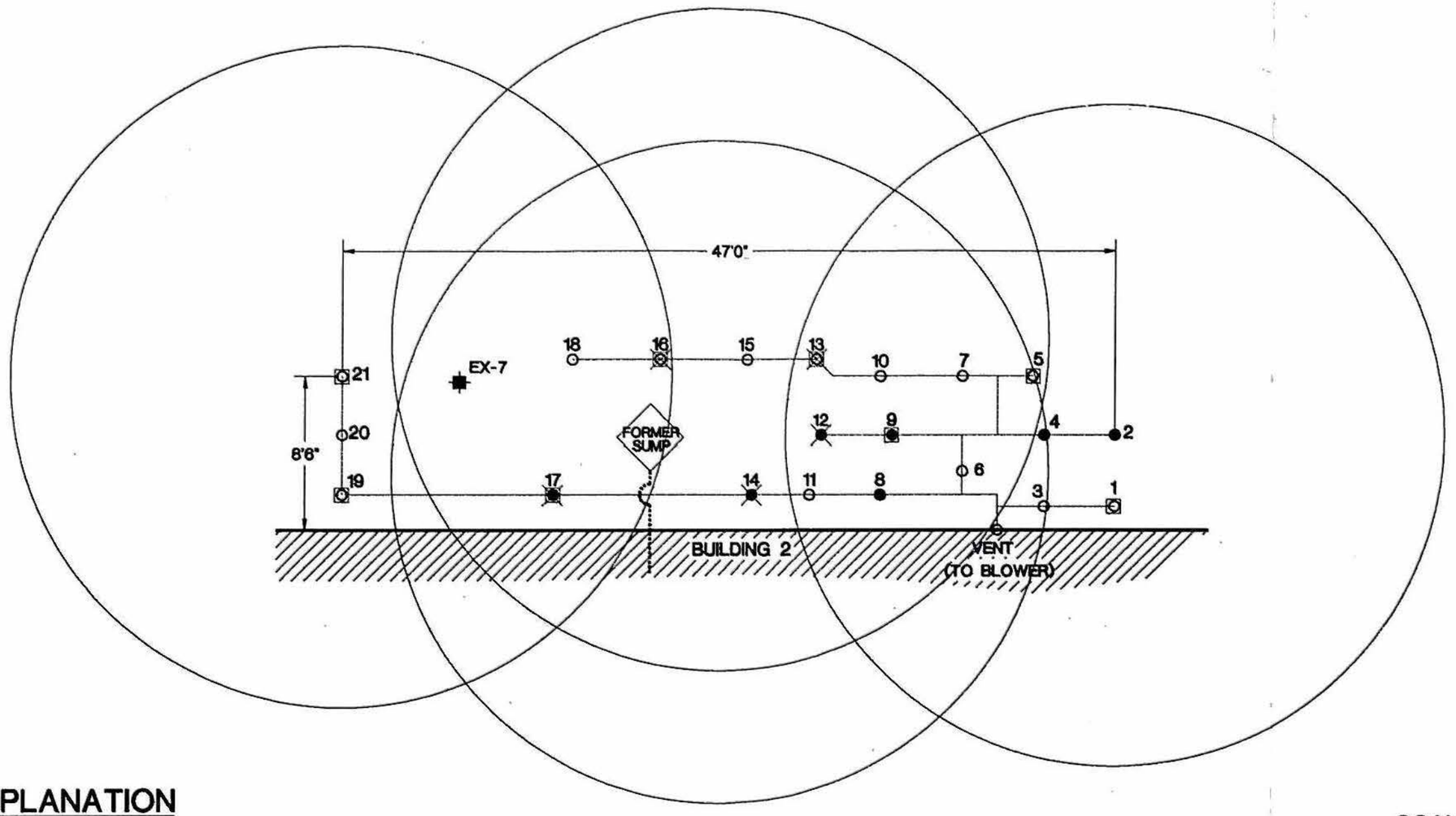
Dsgn. by: JJJ	Chk. by:	Apprv. by: RJC
PROJECT: 350115013	DATE: 02/10/93	

STA-RITE INDUSTRIES, INC.
DELAVAN, WISCONSIN

PROPOSED PLANT #2 S.E. REMEDIATION SYSTEM LAYOUT

DRAWING: 1501-61a | FIGURE: 2-2

/hsi/15013/1501-61a



EXPLANATION

EX-7 ✱ EXTRACTION WELL LOCATION AND DESIGNATION

19 ○ VENT PIPE LOCATION AND DESIGNATION

– – – – 2" PVC PIPE

● EXTRACTION VENTS

□ OBSERVATION VENTS

╳ LITTLE TO NO VACUUM RESPONSE

RADIUS OF INFLUENCE = 20'

N

SCALE

0 15

Feet

SIMON HYDRO-SEARCH

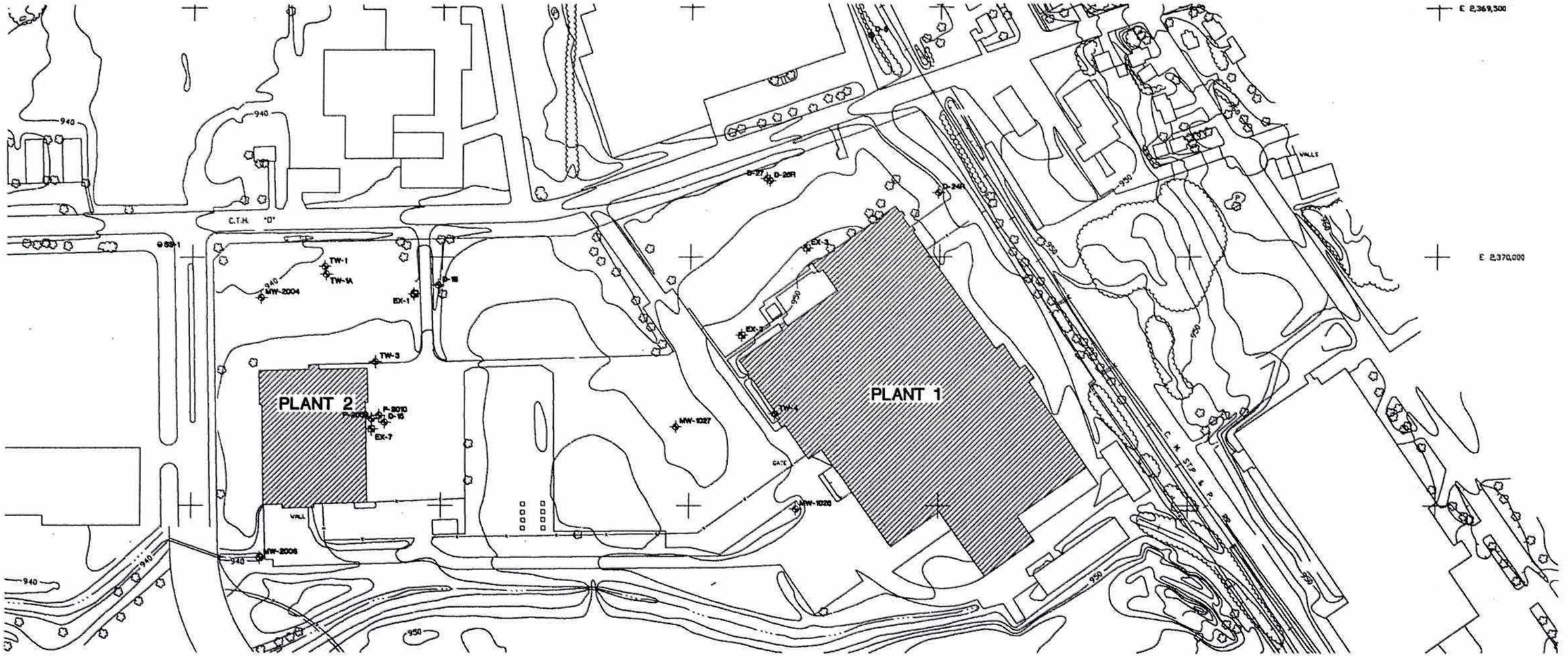
Brookfield Lakes Corporate Center XII
175 N. Corporate Drive, Suite 100
Brookfield, Wisconsin 53045

STA-RITE INDUSTRIES INC.
DELAVAN, WISCONSIN

PROPOSED PLANT #2 FORMER SUMP REMEDIATION SYSTEM LAYOUT

Dsgn. by: JJJ	Chk. by:	Apprv. by: RJK
PROJECT: 350115013	DATE: 02/10/93	
DRAWING: 1501-28	FIGURE: 2-3	

/hsi/15013/1501-28



EXPLANATION

- MW-2004 — MONITOR WELL LOCATION AND DESIGNATION
- E-3 — EXTRACTION WELL LOCATION AND DESIGNATION
- SS-1 — STORM SEWER SAMPLE LOCATION AND DESIGNATION
- P-2009 — PIEZOMETER LOCATION AND DESIGNATION

NOTE: MW-2004 Installed by Simon Hydro-Search
D-24R Replacement Installed by Simon Hydro-Search
D-18 Installed by Donohue
TW-1 Installed by Warzyn

SCALE
0 — 500
Feet

N

Base map from Aero-Metric Engineering, 4-16-88.

SIMON HYDRO-SEARCH
Brookfield Lakes Corporate Center XII
175 N. Corporate Drive, Suite 100
Brookfield, Wisconsin 53045

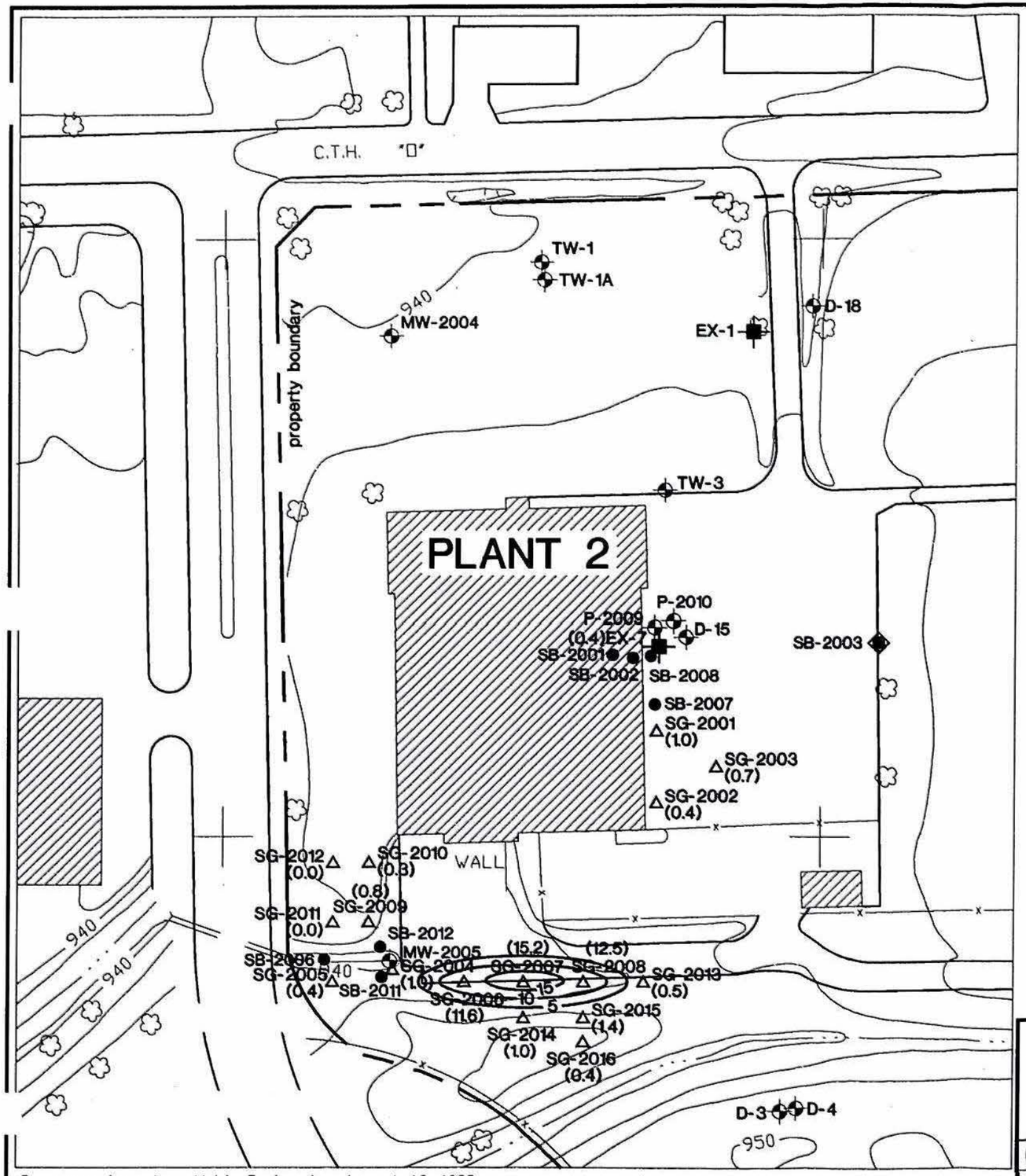
Dsgn. by: JJJ	Chk. by: RJK	Apprv. by:
PROJECT: 350115013	DATE: 02/10/93	

STA-RITE INDUSTRIES, INC.
DELAVAN, WISCONSIN

MONITORING POINT LOCATIONS

DRAWING: 1501-29 | FIGURE: 4-1

APPENDIX A
SOIL GAS SURVEY MAPS



Base map from Aero-Metric Engineering, Inc., 4-16-1988.

/hai/15013/1501-b16

EXPLANATION

- MW-2005 ⊕ MONITOR WELL LOCATION AND DESIGNATION
- EX-7 ✚ EXTRACTION WELL LOCATION AND DESIGNATION
- SB-2007 ● BOREHOLE LOCATION AND DESIGNATION
- SB-2003 ◆ EXISTING SCREENED AUGER LOCATION AND DESIGNATION
- SG-1024 (8.2) △ SOIL GAS SAMPLING LOCATION, DESIGNATION AND PID READING (ppm)
- 10 PHOTOIONIZATION DETECTOR CONTOUR (ppm)

NOTES: Analytical results for highest concentration reported. Sampling depths and results are summarized on Table

Well Designations:
MW-2004 Installed by Simon Hydro-Search
P-2010 Piezometer installed by Simon Hydro-Search
D-15 Installed by Donohue
TW-1 Installed by Warzyn

Borehole Designations:
SB-2007 Installed by Simon Hydro-Search

N

SCALE
0 300
Feet

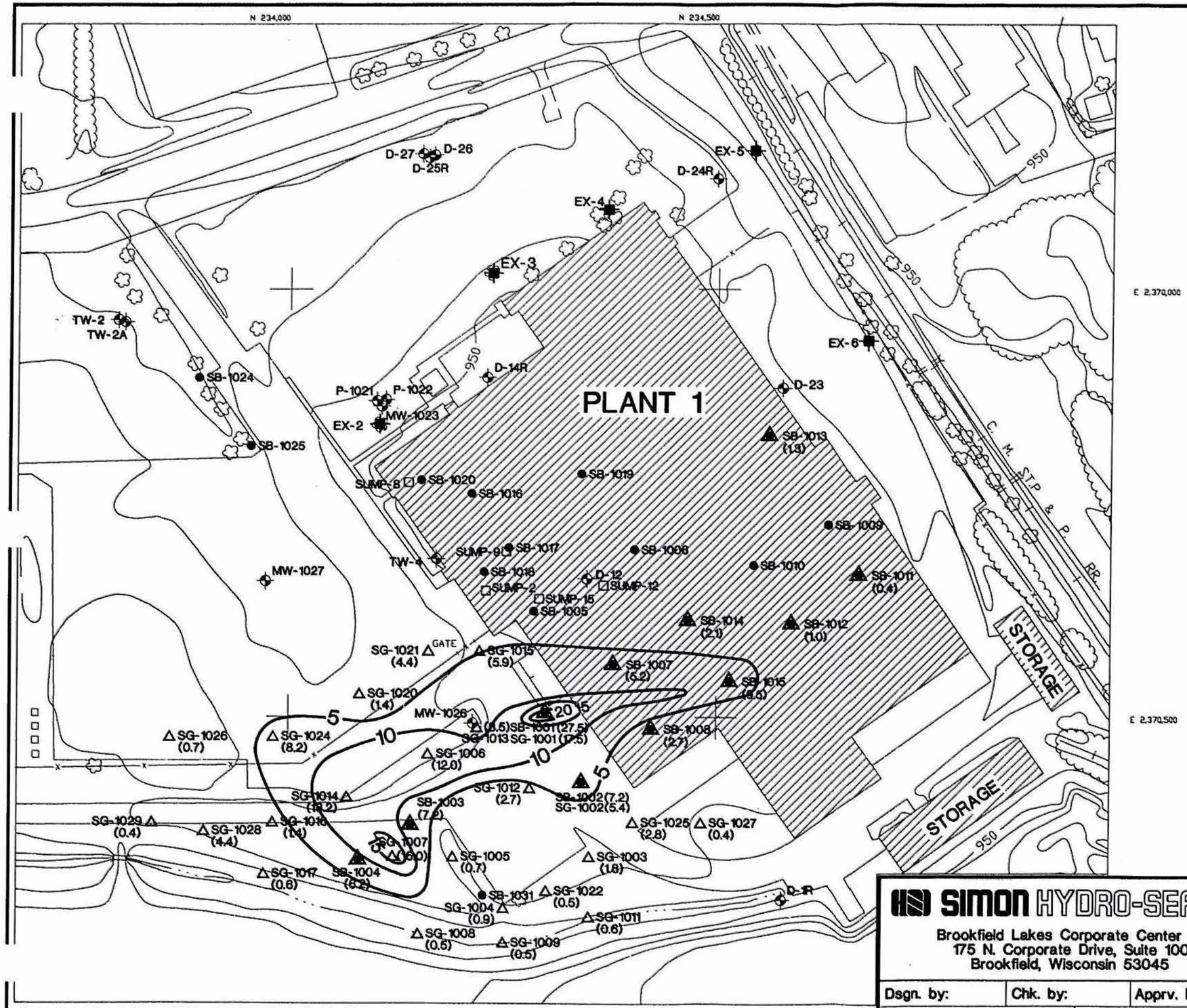
SIMON HYDRO-SEARCH
Brookfield Lakes Corporate Center XII
175 N. Corporate Drive, Suite 100
Brookfield, Wisconsin 53045

Dsgn. by:	Chk. by:	Apprv. by:
PROJECT: 350115013	DATE: 03/17/93	

STA-RITE INDUSTRIES, INC.
DELAVAN, WISCONSIN

PLANT 2 SOIL GAS SAMPLING RESULTS

DRAWING: 1501-b16 | FIGURE: RD/RA A-1



Base map from Aero-Metric Engineering, 4-16-88.

EXPLANATION

- MW-1023 — MONITOR WELL LOCATION AND DESIGNATION
- EX-2 — EXTRACTION WELL LOCATION AND DESIGNATION
- SB-1006 — BOREHOLE LOCATION AND DESIGNATION
- SB-1008 — BOREHOLE/SOIL GAS PROBE LOCATION, DESIGNATION AND PID READING (ppm)
- SG-1024 (8.2) — SOIL GAS SAMPLING LOCATION, DESIGNATION AND PID READING (ppm)
- SUMP-9 — SUMP LOCATION AND DESIGNATION
- 10 — PHOTOIONIZATION DETECTOR CONTOUR (ppm)

NOTES: Analytical results for highest concentration reported. Sampling depths and results are summarized on Table
(ND) Indicates not detected above analytical detection limit.

Well Designations:
MW-1023 Installed by Simon Hydro-Search
D-24R Replacement Installed by Simon Hydro-Search
P-1022 Piezometer Installed by Simon Hydro-Search
D-27 Installed by Donohue
TW-2 Installed by Warzyn

Borehole Designations:
SB-1006 Installed by Simon Hydro-Search

N

SCALE
0 250
FEET

SIMON HYDRO-SEARCH
Brookfield Lakes Corporate Center XII
175 N. Corporate Drive, Suite 100
Brookfield, Wisconsin 53045

Dsgn. by:	Chk. by:	Apprv. by:
PROJECT: 350115013	DATE: 03/17/93	

STA-RITE INDUSTRIES, INC.
DELAVAN, WISCONSIN

PLANT 1 SOIL GAS SAMPLING RESULTS

DRAWING: 1501-b9 | FIGURE: RD/RA A-2

/hsi/15013/1501-b9

APPENDIX B

TROUBLESHOOTING GUIDE - SVE UNIT

To be inserted once SVE unit is ordered.

APPENDIX C
FORMS FOR DATA COLLECTION AND RECORDS

STA-RITE INDUSTRIES, INC.

SOIL VAPOR EXTRACTION

SAMPLING DATA SHEET

Sta-Rite Industries, Inc.
293 South Wright Street
Delavan, WI 53115

Date Performed: _____

Sampling Performed by:

_____

Sampling Location: ☐ Plant 1 ☐ Plant 2: Former Sump Area ☐ Plant 2: Truck Dock Area

Sampling Conditions (# of wells, water extracted, etc.): _____

_____

_____

Ambient Barometric Pressure: _____ Ambient Temperature: _____

Pump Model & Serial #: _____ Rotometer #: _____

Sample Type/Medium					
Filter/Tube No.					
Time ON					
Time OFF					
Total Time (min.)					
Flow Rate, Start					
Flow Rate, End					
Volumes (liters)					
Sampling Gas Temperature					
Sampling Gas Pressure					
Chemical Analytes a.					
b.					
c.					
d.					

Supporting Samples: Blanks (#s): _____

Date Shipped: _____ Interferences: _____

Soil Vapor Sampling Results

Date: _____

Air Sample Number	System Flow Rate (cfm)	Sample Volume (l)	TCE			TPH		
			µg Collected	$Conc_3$ mg/m^3	Emissions lbs/day	µg Collected	$Conc_3$ mg/m^3	Emissions lbs/hr.

Notes: cfm = cubic feet per minute
l = liters
µ = micrograms
$Conc_3$ = Concentration of compound in air emissions
mg/m^3 = Milligrams of compound per cubic meter of air

FORM 2

STA-RITE INDUSTRIES, INC.

DELAVAN , WISCONSIN

DAILY OPERATIONAL LOG

Date	Hour Meter Reading	Operating Exhaust Temperature (°F)	Inlet Vacuum (" Hg)	Exhaust Pressure (" Water)	Special Vacuum Reading and Location	Running Lights Checked	Initials of Technician

FORM 3

STA-RITE INDUSTRIES, INC.

DELAVAN, WISCONSIN

Date	Weekly Hour Meter Log				Weekly Water Meter Log			Initials
	Present	Previous	Total Operating Hours / Days		Present	Previous	Gallons Per Week	
			/		a) b)			
			/		a) b)			
			/		a) b)			
			/		a) b)			
			/		a) b)			
			/		a) b)			
			/		a) b)			
			/		a) b)			
			/		a) b)			
			/		a) b)			
			/		a) b)			
			/		a) b			
			/		a) b)			
			/		a) b)			
			/		a) b)			

FORM 4

SIMON HYDRO-SEARCH

STA-RITE INDUSTRIES, INC.
DELAVAN, WISCONSIN

PERIODIC OPERATIONS REPORT
MONTH/YEAR: _____

Date: _____ Recorded By: _____

Equipment	Status	Action Plan
1. Blower/Fan Belt		
2. Motor/rpm and Current		
3. Main Vacuum Connection		
4. Condensate Pump		
5. Vacuum and Pressure Gages		
6. Ground-Water Pumps		
7. Water Piping & Flow Rate		
8. Vacuum Piping		
9. Well Heads/Above Ground Piping		

FORM 5

APPENDIX D

BILL OF MATERIALS

SHEETS 1 THROUGH 5

Milwaukee (414)-792-1282 FAX: (414)-792-1310	BILL OF MATERIAL	SHEET NO: 1 of 5	
PROJECT #: 350115013	Sta-Rite Industries, Inc., Delavan, Wisconsin	Date:	3/17/93
TASK #: 9003	Soil Vapor and Ground-Water Extraction	Engr.JJR	Dsnr. RAS

ITEM #	DESCRIPTION	COST	QUANTITY REQUIRED	SUPPLIED BY	TELEPHONE #	COMMENTS
01	6" Andrews Cam and Groove Coupler		1	Umisco New Berlin, WI	(414) 796-2808 Dave Breski	
02	6" Nominal I.D. Flex Hose 10' Long		1	Same as Item #1	Same as Item #1	
03	6" Steel Nipple MPT x SLIP		2	Same as Item #1	Same as Item #1	
04	6" Steel Flange Threaded End		2	Same as Item #1	Same as Item #1	
05	1" Gate Valve Gal. Iron FPT w/Male Hose Connection		10			*
06	1" Tee Threaded Gal. Iron		10			
07	4" Tee Threaded Branch**		1	Grinnell Co.	(414) 937-8000	Gruvlok Type
08	6" x 4" Reducing Adapter FPT (Andrews)		1	Same as Item #1	Same as Item #1	
09	4" PVC Ball Valve, SW		1			*
10	4" Steel Ball Valve, Flanged		1			*
11	4" Flange**		As Required	Same as Item #7	Same as Item #7	Gruvlok Type
12	4" Nipple 12" long GR x THD**		1	Same as Item #7	Same as Item #7	Gruvlok Type
13	4" PVC Elbow, 90° SW		As Required			*
14	4" PVC Flange, THD		As Required			*
15	1" 90° Elbow, Gal. Iron		As Required			*

* Indicates items to be purchased by Sta-Rite through price comparison from multiple suppliers.
**Indicates PVC fittings may be substituted instead of SCH 10 steel/Gruvlok items.

Milwaukee (414)-792-1282 FAX: (414)-792-1310	BILL OF MATERIAL	SHEET NO: 2 of 5	
PROJECT #: 350115013	Sta-Rite Industries, Inc., Delavan, Wisconsin	Date:	13/17/93
TASK #: 9003	Soil Vapor and Ground-Water Extraction	Engr:JJR	Dsnr. RAS

ITEM #	DESCRIPTION	COST	QUANTITY REQUIRED	SUPPLIED BY	TELEPHONE #	COMMENTS
16	6" Coupling**		As Required	Same as Item #7	Same as Item #7	Gruvlok Type
17	6" Coupler Adapter (Andrews)		1	Same as Item #1	Same as Item #1	
18	2" x 2" x 1" PVC Tee		As Required			*
19	6" x 6" x 4" Tee Wye**		As Required	Same as Item #7	Same as Item #7	Gruvlok Type
20	6" Nipple 12" Long GR x THD**		1	Same as Item #7	Same as Item #7	Gruvlok Type
21	4" Coupling**		As Required	Same as Item #7	Same as Item #7	Gruvlok Type
22	1/2" Ball Valve		5			Steel or Bronze
23	1/8" x 3/16" Adapter MPT x Hose I. D., Brass		6	(Swagelok) Badger Valve	(414) 774-0552	
24	1/2" x 1/8" Reducing Bushing MPT x FPT, Steel		6	Same as Item #23	Same as Item #23	
25	1" x 1/2" Reducing Adapter FPT x MPT, Steel		5	Same as Item #23	Same as Item #23	
26	4" x 1" Reducer, Steel**		2	Same as Item #7	Same as Item #7	Gruvlok
27	1/2" PVC Flange		1			*
28	1/2" PVC Nipple 6" Long		1			*
29	4" x 2" Reducer PVC SW		1			*

* Indicates items to be purchased by Sta-Rite through price comparison from multiple suppliers.
**Indicates PVC fittings may be substituted instead of SCH 10 steel/Gruvlok items.

Milwaukee
(414)-792-1282
FAX: (414)-792-1310

BILL OF MATERIAL

PROJECT #: 350115013
TASK #: 9003

Sta-Rite Industries, Inc., Delavan, Wisconsin
Soil Vapor and Ground-Water Extraction

Date: 13/17/93
Engr:JJR | Dsnr. RAS

ITEM #	DESCRIPTION	COST	QUANTITY REQUIRED	SUPPLIED BY	TELEPHONE #	COMMENTS
30	4" Cross PVC, SW		1			*
31	4" x 2" PVC Reducer SW		2			*
32	2" x 1/2" Reducer PVC, SW		1			*
33	1/2" Flange Steel, THD		1			*
34	1/2" Steel Nipple THD Both Ends		1	Same as Item #23	Same as Item #23	
35	4" PVC THD Cap		As Required			*
36	4" PVC Tee, SW		As Required			*
37	4" PVC Flange, SW		As Required			*
38	6" Coupling, Steel, Sch 10**		As Required	Same as Item #7	Same as Item #7	Gruvlok
39	1" Check Valve Steel or Bronze		10			*
40	1" Valve Steel or Bronze		10			*
41	2" Coupling, Steel**		3	Same as Item #7	Same as Item #7	Gruvlok
42	6" x 2" Reducer, Steel**		3	Same as Item #7	Same as Item #7	Gruvlok
43	1" Gal. Iron Pipe Nipple 6" Long THD		As Required			*
44	Well Seal 4" Simmons #301		10	(Sta-Rite)		Stock Item
45	4" Tee Wye, Steel**		As Required	Same as Item #7	Same as Item #7	

* Indicates items to be purchased by Sta-Rite through price comparison from multiple suppliers.
**Indicates PVC fittings may be substituted instead of SCH 10 steel/Gruvlok items.

Milwaukee (414)-792-1282 FAX: (414)-792-1310	BILL OF MATERIAL	SHEET NO: 4 of 5	
PROJECT #: 350115013	Sta-Rite Industries, Inc., Delavan, Wisconsin	Date:	13/17/93
TASK #: 9003	Soil Vapor and Ground-Water Extraction	Engr: JJR	Dsnr. RAS

ITEM #	DESCRIPTION	COST	QUANTITY REQUIRED	SUPPLIED BY	TELEPHONE #	COMMENTS
46	4" Flex Hose Puma Tank Truck		As Required	Same as Item #1	Same as Item #1	Optional Item Assembled with #47 and #48
47	4" Combination Nipple Steel THD x SLIP		As Required	Same as Item #1	Same as Item #1	Optional Item Assembled with #46 and #48
48	4" Steel Flanges Threaded		As Required	Same as Item #1	Same as Item #1	Optional Item Assembled with #46 and #47
49	4" Schedule 40 PVC		600' Minimum			*
50	4" Steel Pipe or PVC		400' Minimum	Same as Item #7	Same as Item #7	Gruvlok
51	6" Steel Pipe or PVC		1,600' Minimum	Same as Item #7	Same as Item #7	Gruvlok
52	2" PVC Schedule 40 Pipe		300' Minimum			*
53	4" PVC Nipple 6" Long THD x Plain End		As Required			*
54	1" Gal. Iron Pipe		200' Minimum			*
55	3" PVC Pipe		1,350' Minimum			*
56	3" PVC WYE		1			*
57	2" PVC 45° Elbow		3			*
58	3" x 2" PVC Reducer sw		3			*
59	2" PVC 90° Elbow		3			*

* Indicates items to be purchased by Sta-Rite through price comparison from multiple suppliers.
**Indicates PVC fittings may be substituted instead of SCH 10 steel/Gruvlok items.

milwaukee (414)-792-1282 FAX: (414)-792-1310	BILL OF MATERIAL	SHEET NO: 5 of 5	
PROJECT #: 350115013	Sta-Rite Industries, Inc., Delavan, Wisconsin	Date:	13/17/93
TASK #: 9003	Soil Vapor and Ground-Water Extraction	Engr:JJR	Dsnr. RAS

ITEM #	DESCRIPTION	COST	QUANTITY REQUIRED	SUPPLIED BY	TELEPHONE #	COMMENTS
60	2" x 1" PVC Reducer SW x SW		3			*
61	4" PVC Nipple 6" Long Plain Ends		As Required			*
(See Comment)	GW Pump, Sta-Rite Model #10P4DO2T-02, Size 4, 8-stage, 0.75 HP, 3450 RPM	(See Comment)	10	Sta-Rite	(See Comment)	Item not shown on the drawings

* Indicates items to be purchased by Sta-Rite through price comparison from multiple suppliers.
**Indicates PVC fittings may be substituted instead of SCH 10 steel/Gruvlok items.

SHEET No.	TITLE
1	ISOMETRIC PIPING PLANT 1
2	FORMER SUMP AREA ISOMETRIC PIPING PLANT 2
3	SOUTHEAST SOURCE AREA ISOMETRIC PIPING PLANT 2
4	WELL CONSTRUCTION AND HEADER DETAILS
5	TYPICAL CONNECTION DETAILS
6	MANOMETER CONNECTION DETAILS
7	SITE LAYOUT REMEDIATION HEADER PIPING
8	MAIN CONNECTIONS: VACUUM AND GROUND WATER DISCHARGE

STA-RITE® INDUSTRIES, INC.
a *WICOR* company

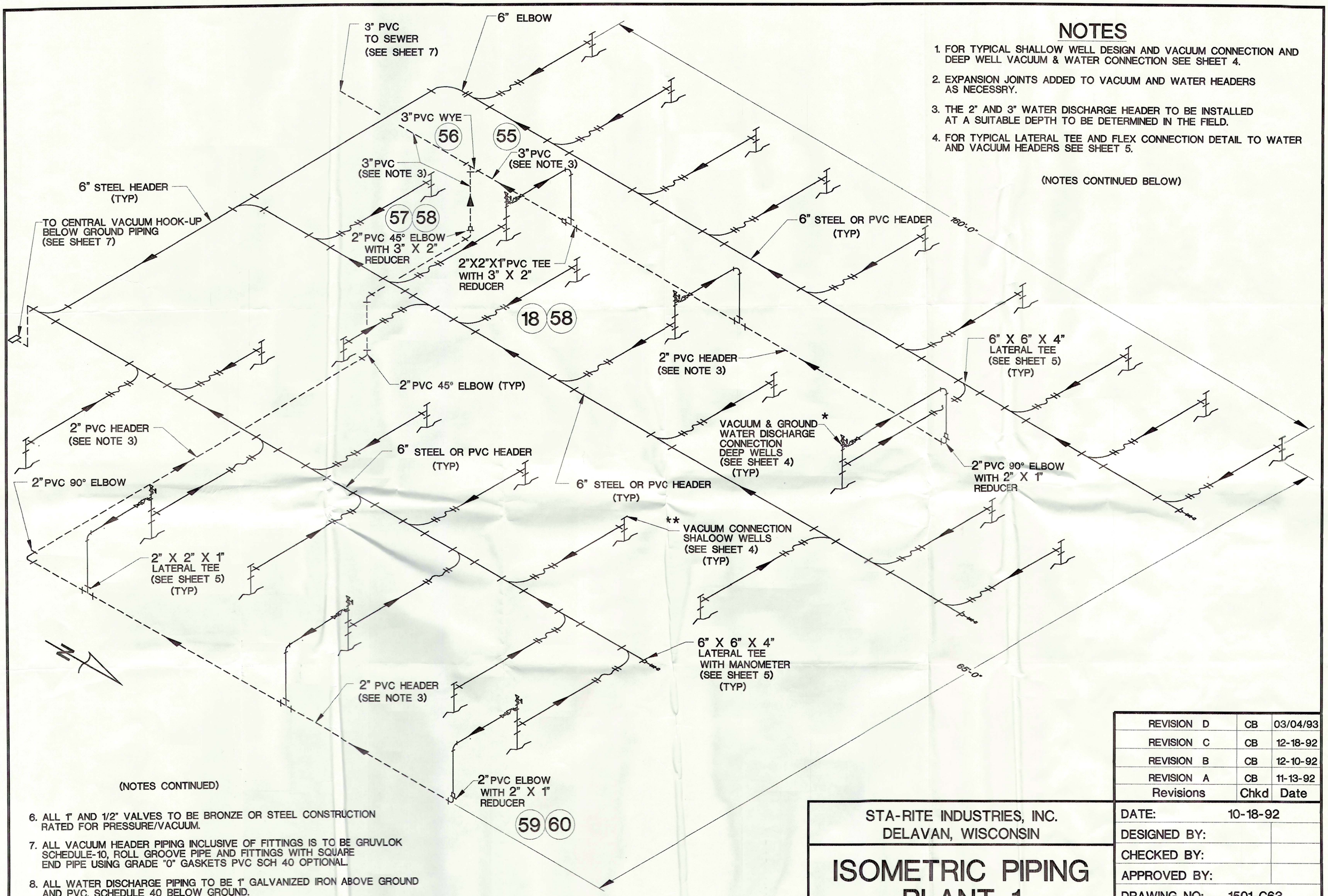
STA-RITE INDUSTRIES INC.
DELAVAN, WISCONSIN

LIST OF DRAWINGS

SIMON HYDRO-SEARCH
Brookfield Lakes Corporate Center XII
175 N. Corporate Drive, Suite 100
Brookfield, Wisconsin 53045

DATE:	12-21-92
DESIGNED BY:	
CHECKED BY:	
APPROVED BY:	
DRAWING NO:	1501-C39
PROJECT:	350115013
SHEET:	0 of 8

/hsi/15013/1501-C39



NOTES

1. FOR TYPICAL SHALLOW WELL DESIGN AND VACUUM CONNECTION AND DEEP WELL VACUUM & WATER CONNECTION SEE SHEET 4.
2. EXPANSION JOINTS ADDED TO VACUUM AND WATER HEADERS AS NECESSRY.
3. THE 2" AND 3" WATER DISCHARGE HEADER TO BE INSTALLED AT A SUITABLE DEPTH TO BE DETERMINED IN THE FIELD.
4. FOR TYPICAL LATERAL TEE AND FLEX CONNECTION DETAIL TO WATER AND VACUUM HEADERS SEE SHEET 5.

(NOTES CONTINUED BELOW)

(NOTES CONTINUED)

6. ALL 1" AND 1/2" VALVES TO BE BRONZE OR STEEL CONSTRUCTION RATED FOR PRESSURE/VACUUM.
7. ALL VACUUM HEADER PIPING INCLUSIVE OF FITTINGS IS TO BE GRUVLOK SCHEDULE-10, ROLL GROOVE PIPE AND FITTINGS WITH SQUARE END PIPE USING GRADE "O" GASKETS PVC SCH 40 OPTIONAL.
8. ALL WATER DISCHARGE PIPING TO BE 1" GALVANIZED IRON ABOVE GROUND AND PVC, SCHEDULE 40 BELOW GROUND.
9. FOR DETAILS OF MAIN VACUUM CONNECTION SEE SHEET 5 AND FOR 1/2" MANOMETER CONNECTION SEE SHEET 6.

ISOMETRIC PIPING

** (23) SHALLOW VAPOR EXTRACTION WELLS
* (6) DEEP WATER AND VAPOR EXTRACTION WELLS
(DRAWING NOT TO SCALE)

Revisions	Chkd	Date
REVISION D	CB	03/04/93
REVISION C	CB	12-18-92
REVISION B	CB	12-10-92
REVISION A	CB	11-13-92

STA-RITE INDUSTRIES, INC.
DELAVAN, WISCONSIN

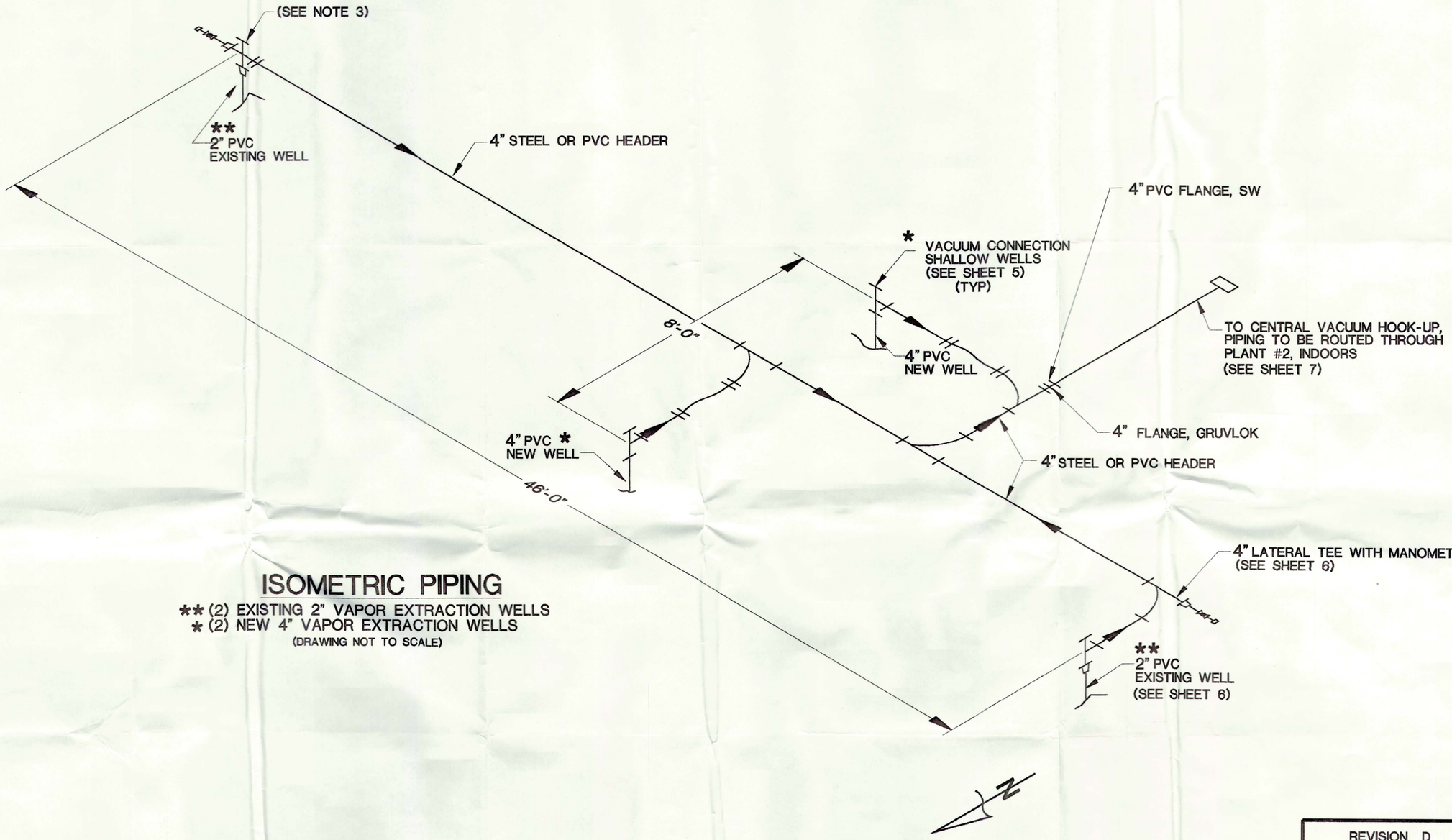
ISOMETRIC PIPING PLANT 1

DATE:	10-18-92
DESIGNED BY:	
CHECKED BY:	
APPROVED BY:	
DRAWING NO:	1501-C63
PROJECT:	350115013

SIMON HYDRO-SEARCH
Brookfield Lakes Corporate Center XII
175 N. Corporate Drive, Suite 100
Brookfield, Wisconsin 53045

SHEET: 1 of 8

/hsi/15013/1501-C63



ISOMETRIC PIPING

** (2) EXISTING 2" VAPOR EXTRACTION WELLS
* (2) NEW 4" VAPOR EXTRACTION WELLS
(DRAWING NOT TO SCALE)

NOTES

1. FOR TYPICAL SHALLOW WELL DESIGN AND VACUUM CONNECTION SEE SHEET 4.
2. EXPANSION JOINTS TO BE ADDED TO VACUUM HEADER AS NECESSARY.
3. THE 4" WELL HEAD CONNECTION IS INSTALLED WITH A CROSS IN LIEU OF A TEE. SEE SHEET 6.
4. FOR TYPICAL LATERAL TEE AND FLEX CONNECTION DETAILS TO WATER AND VACUUM HEADERS SEE SHEET 5.
5. ALL 1/2" BALL VALVES TO BE BRONZE OR STEEL CONSTRUCTION RATED FOR PRESSURE/ VACUUM.
6. ALL VACUUM HEADER PIPING INCLUSIVE OF FITTINGS IS TO BE GRUVLOK SCHEDULE-10, ROLL GROOVE PIPE AND FITTINGS WITH SQUARE END PIPE USING GRADE "O" GASKETS. PVC SCH 40 OPTIONAL.
7. FOR DETAILS OF MAIN VACUUM CONNECTION SEE SHEET 5 & FOR 2" EXISTING WELL AND MANOMETER CONNECTION SEE SHEET 6.

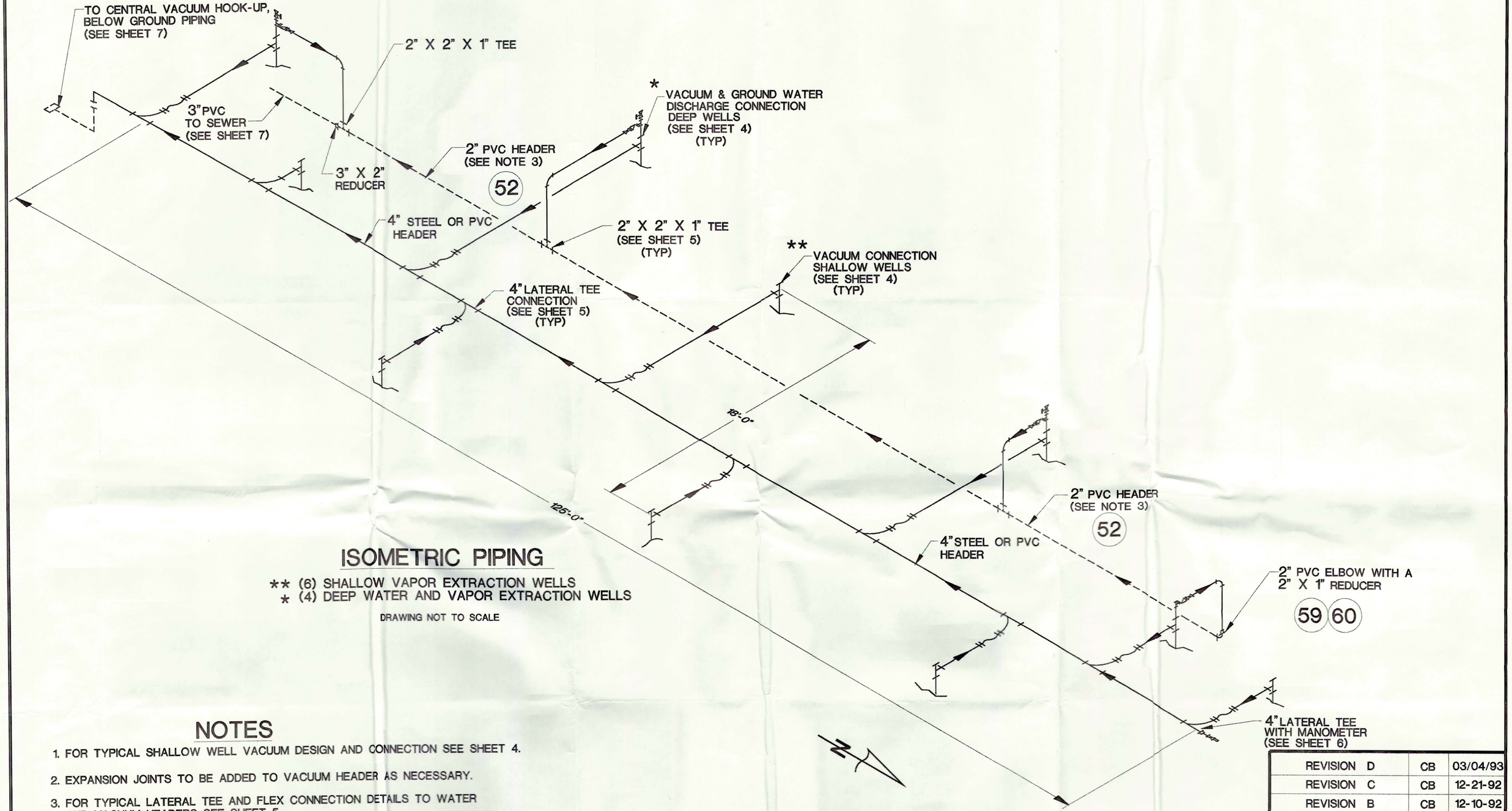
Revisions	Chkd	Date
REVISION D	CB	03/04/93
REVISION C	CB	12-18-92
REVISION B	CB	12-10-92
REVISION A	CB	11-13-92

STA-RITE INDUSTRIES, INC.
DELAVAN, WISCONSIN

FORMER SUMP AREA ISOMETRIC PIPING PLANT 2

DATE:	10-19-92
DESIGNED BY:	
CHECKED BY:	
APPROVED BY:	
DRAWING NO:	1501-C52
PROJECT:	350115013

SIMON HYDRO-SEARCH
Brookfield Lakes Corporate Center XII
175 N. Corporate Drive, Suite 100
Brookfield, Wisconsin 53045



ISOMETRIC PIPING

** (6) SHALLOW VAPOR EXTRACTION WELLS
* (4) DEEP WATER AND VAPOR EXTRACTION WELLS

DRAWING NOT TO SCALE

NOTES

1. FOR TYPICAL SHALLOW WELL VACUUM DESIGN AND CONNECTION SEE SHEET 4.
2. EXPANSION JOINTS TO BE ADDED TO VACUUM HEADER AS NECESSARY.
3. FOR TYPICAL LATERAL TEE AND FLEX CONNECTION DETAILS TO WATER AND VACUUM HEADERS SEE SHEET 5.
4. THE 2" AND 3" WATER DISCHARGE HEADER TO BE INSTALLED AT A SUITABLE DEPTH TO BE DETERMINED IN THE FIELD.
5. ALL 1" AND 1/2" BALL VALVES TO BE BRONZE OR STEEL CONSTRUCTION RATED FOR PRESSURE/ VACUUM.
6. ALL VACUUM HEADER PIPING INCLUSIVE OF FITTINGS IS TO BE GRUVLOK SCHEDULE-10, ROLL GROOVE PIPE AND FITTINGS WITH SQUARE END PIPE USING GRADE "O" GASKETS. PVC SCH 40 OPTIONAL.
7. ALL WATER DISCHARGE PIPING TO BE 1" GALVANIZED IRON ABOVE GROUND AND SCHEDULE 40 PVC BELOW GROUND.
8. FOR DETAILS OF MAIN VACUUM CONNECTION SEE SHEET 5, AND FOR 1/2" MANOMETER CONNECTION SEE SHEET 6.

Revisions	Chkd	Date
REVISION D	CB	03/04/93
REVISION C	CB	12-21-92
REVISION B	CB	12-10-92
REVISION A	CB	11-13-92

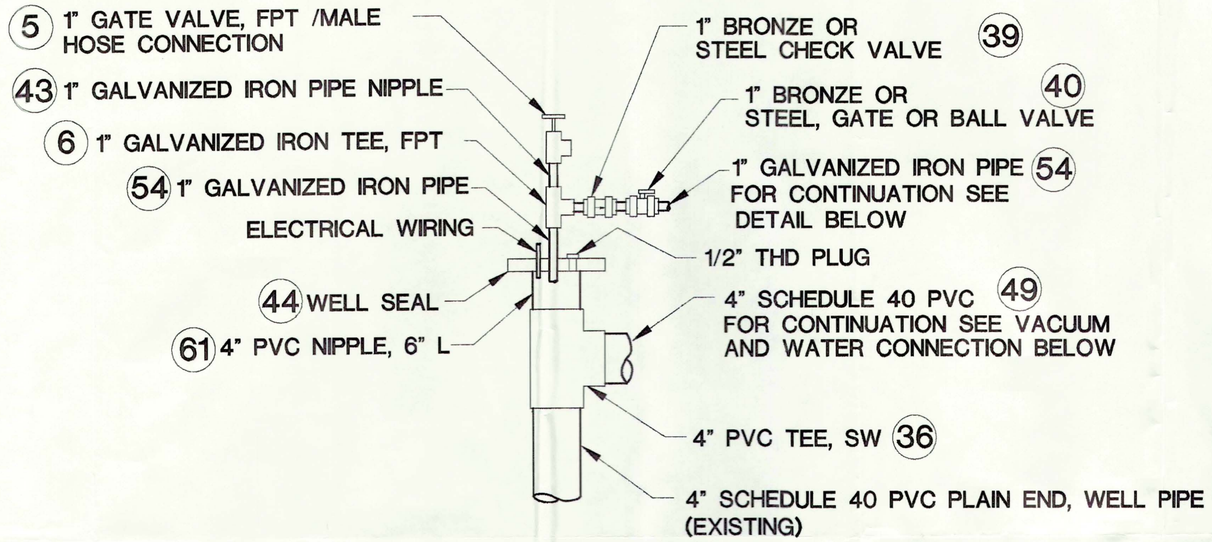
STA-RITE INDUSTRIES, INC.
DELAVAN, WISCONSIN

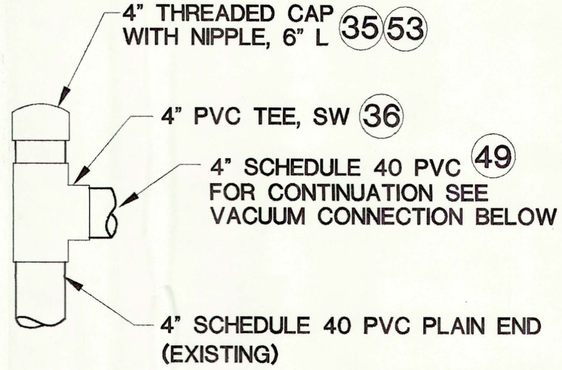
SOUTHEAST SOURCE AREA ISOMETRIC PIPING PLANT 2

SIMON HYDRO-SEARCH
Brookfield Lakes Corporate Center XII
175 N. Corporate Drive, Suite 100
Brookfield, Wisconsin 53045

DATE:	11-13-92
DESIGNED BY:	
CHECKED BY:	
APPROVED BY:	
DRAWING NO:	1501-C53
PROJECT:	350115013
SHEET:	3 of 8

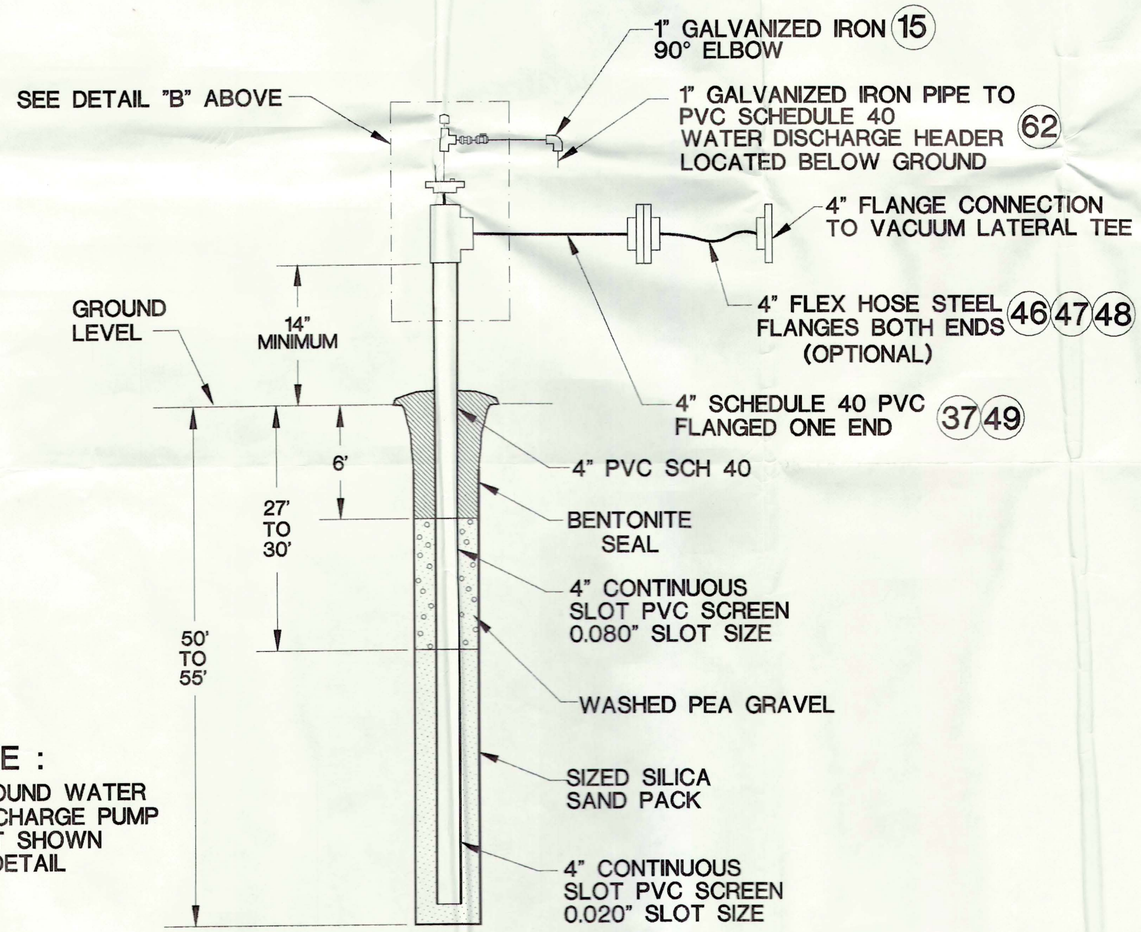
/hsi/15013/1501-C53





DETAIL "A"

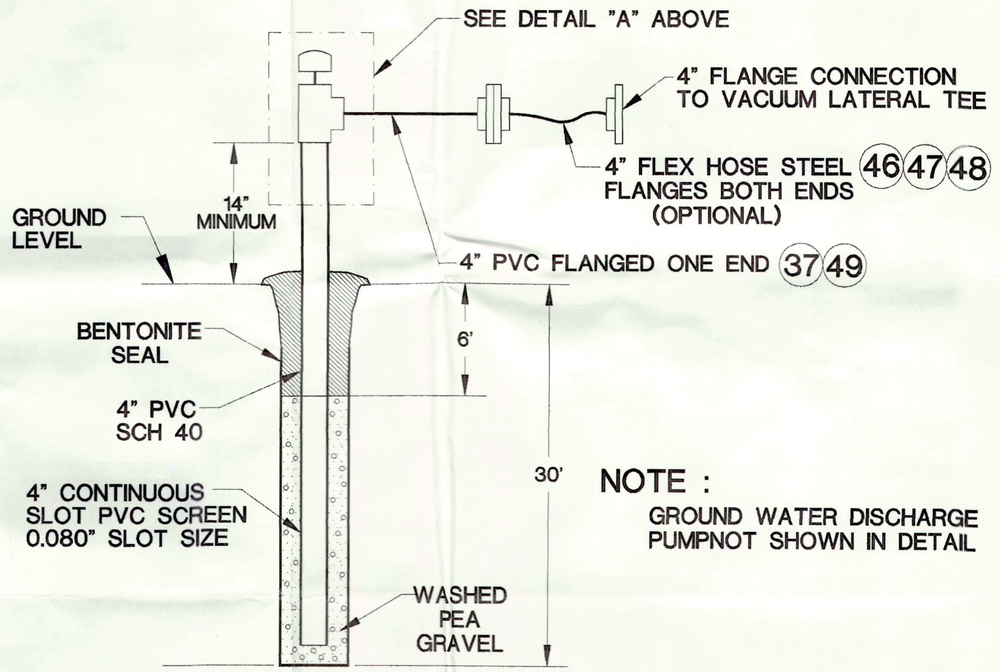
DETAIL "B"



NOTE :
GROUND WATER DISCHARGE PUMP NOT SHOWN IN DETAIL

VACUUM & WATER CONNECTION

DEEP WELLS
(TYP)



NOTE :
GROUND WATER DISCHARGE PUMPNOT SHOWN IN DETAIL

VACUUM CONNECTION

SHALLOW WELLS
(TYP)

Revisions	Chkd	Date
REVISION C	CB	12-21-92
REVISION B	CB	12-10-92
REVISION A	CB	11-13-92

STA-RITE INDUSTRIES INC.
DELAVAN, WISCONSIN

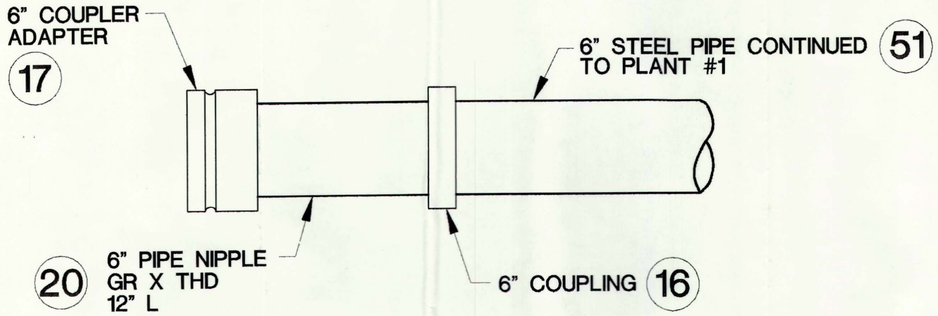
WELL CONSTRUCTION AND HEADER DETAILS

DATE:	10-13-92
DESIGNED BY:	
CHECKED BY:	
APPROVED BY:	
DRAWING NO:	1501-C40
PROJECT:	350115013

SIMON HYDRO-SEARCH
Brookfield Lakes Corporate Center XII
175 N. Corporate Drive, Suite 100
Brookfield, Wisconsin 53045

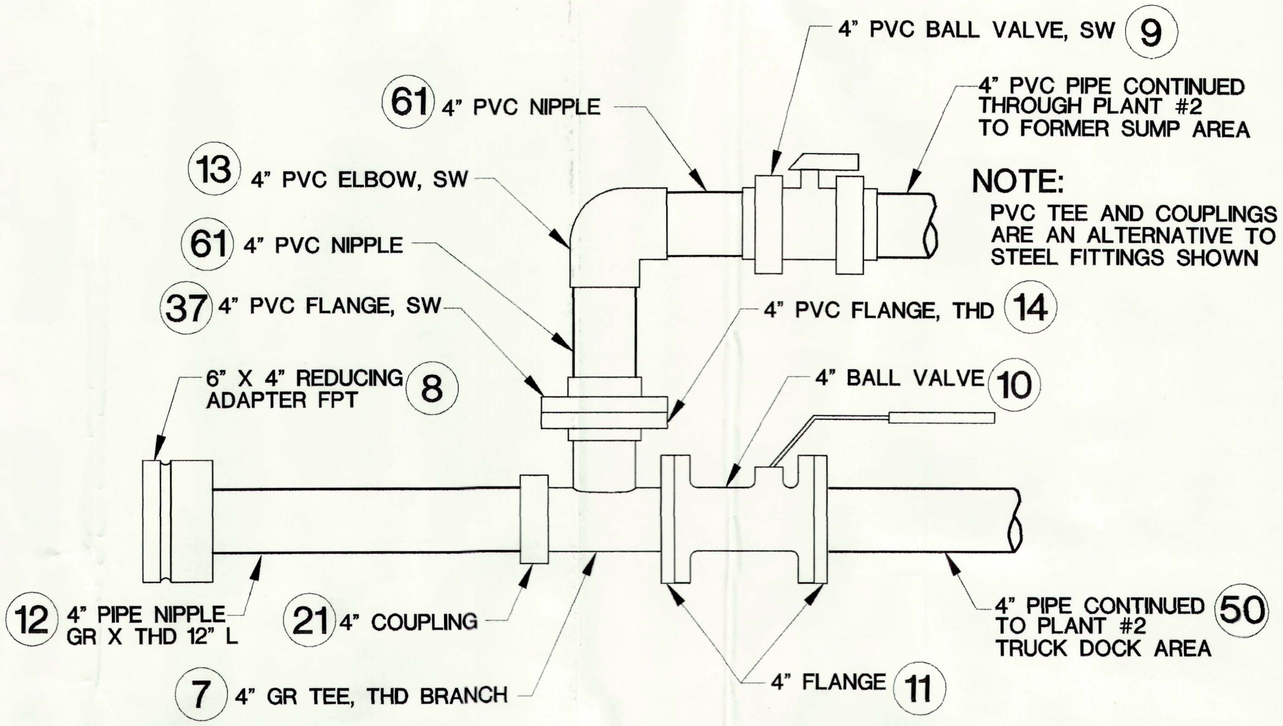
SHEET: 4 of 8

/hsi/15013/1501-c40



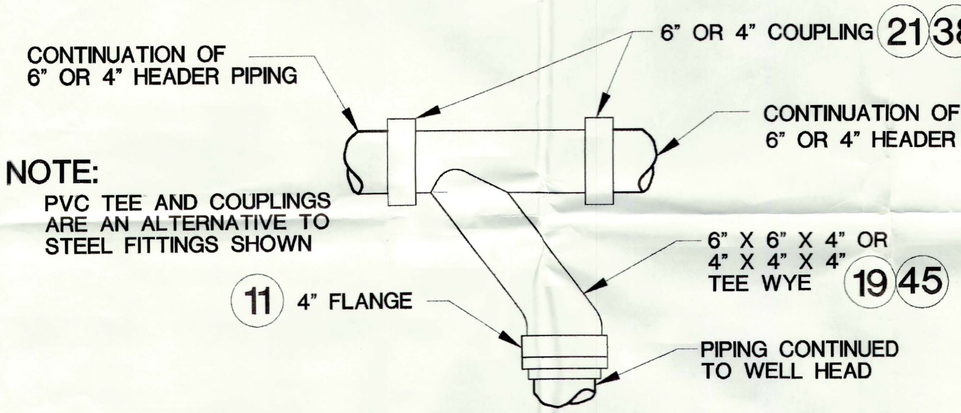
VACUUM CONNECTION 6" HEADER

CONNECTION PLANT #1



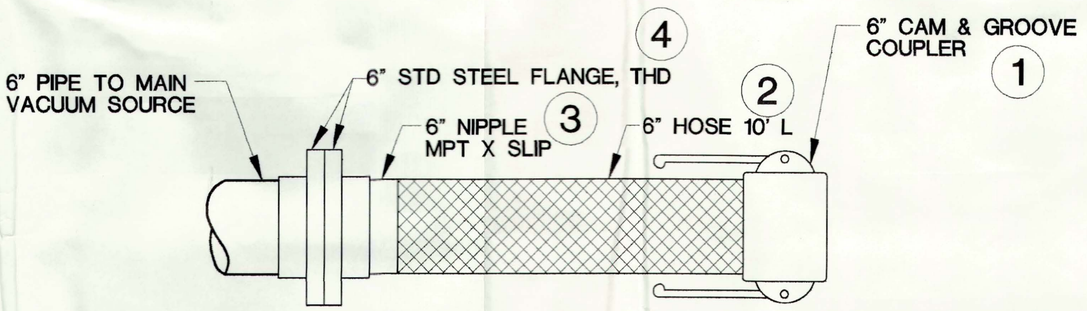
VACUUM CONNECTION 4" HEADER

CONNECTION PLANT #2 TRUCK DOCK & FORMER SUMP AREA



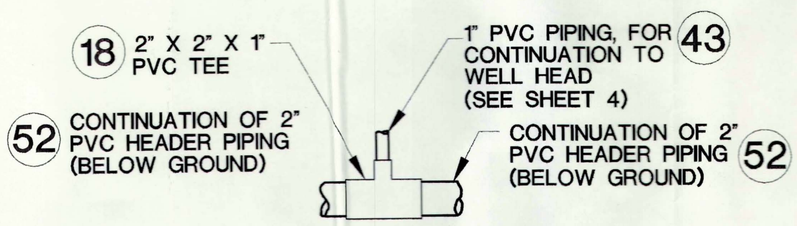
LATERAL TEE VACUUM CONNECTION

TYPICAL 6" OR 4" CONNECTION



MAIN VACUUM CONNECTION

SVE UNIT



LATERAL TEE WATER DISCHARGE CONNECTION

TYPICAL CONNECTION LOCATED BELOW GROUND

REVISION		
REVISION C	WDNR	06/28/93
REVISION B	CB	01/07/93
REVISION A	CB	12-18-92
Revisions	Chkd	Date

STA-RITE INDUSTRIES INC.
DELAVAN, WISCONSIN

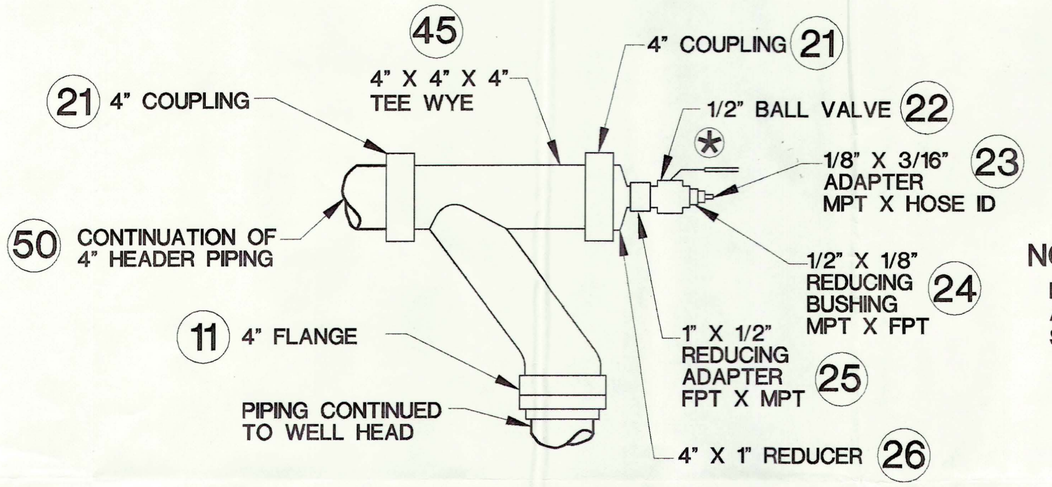
TYPICAL CONNECTION DETAILS

DATE:	10-25-92
DESIGNED BY:	
CHECKED BY:	
APPROVED BY:	
DRAWING NO:	1501-C41
PROJECT:	350115013

SIMON HYDRO-SEARCH
Brookfield Lakes Corporate Center XII
175 N. Corporate Drive, Suite 100
Brookfield, Wisconsin 53045

SHEET: 5 of 8

/hsi/15013/1501-C41

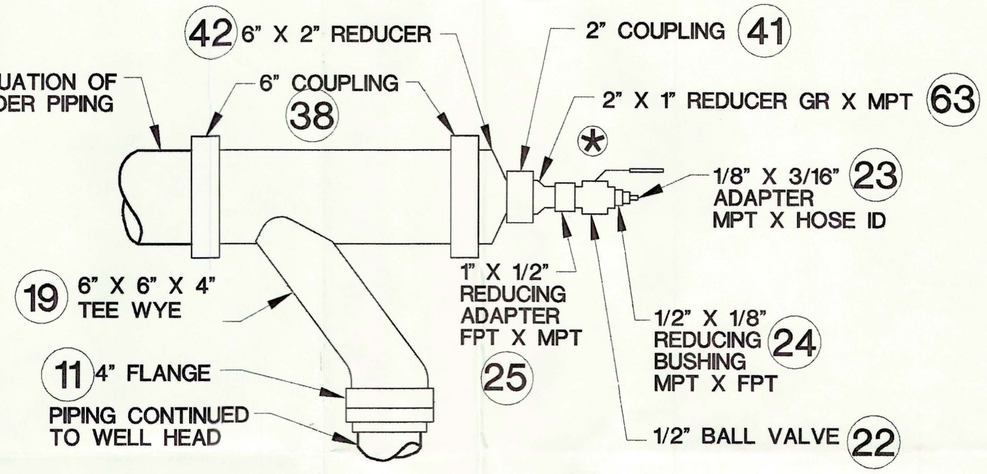


MANOMETER CONNECTION 4" HEADER

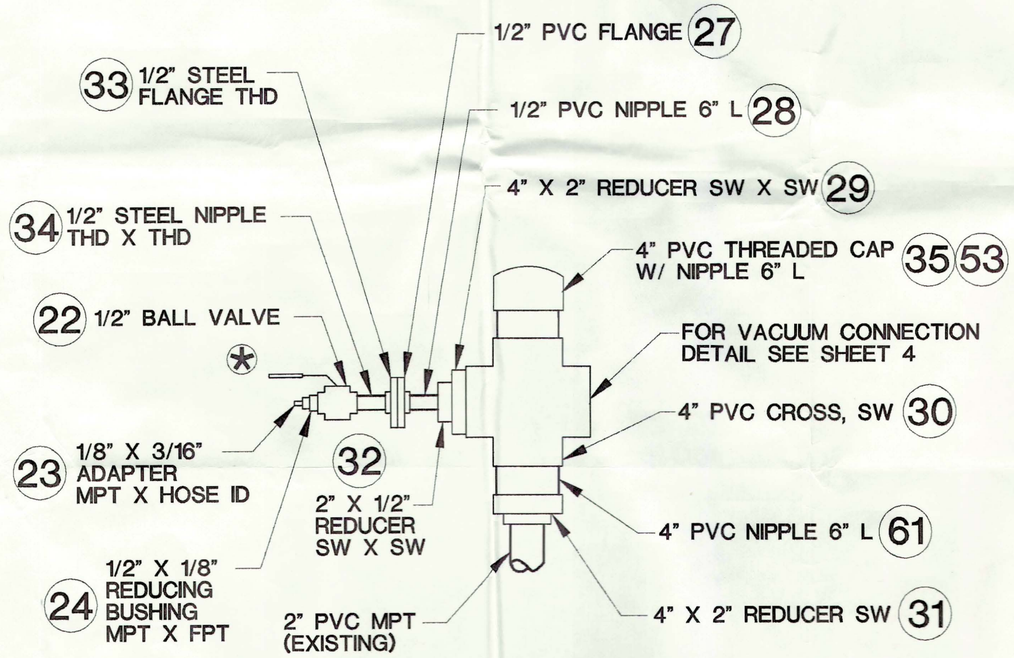
NOTE:

PVC FITTINGS ARE AN ALTERNATIVE TO STEEL FITTINGS SHOWN

* INSTALL HOSE ADAPTER IN ANY CONVENIENT MANNER POSSIBLE

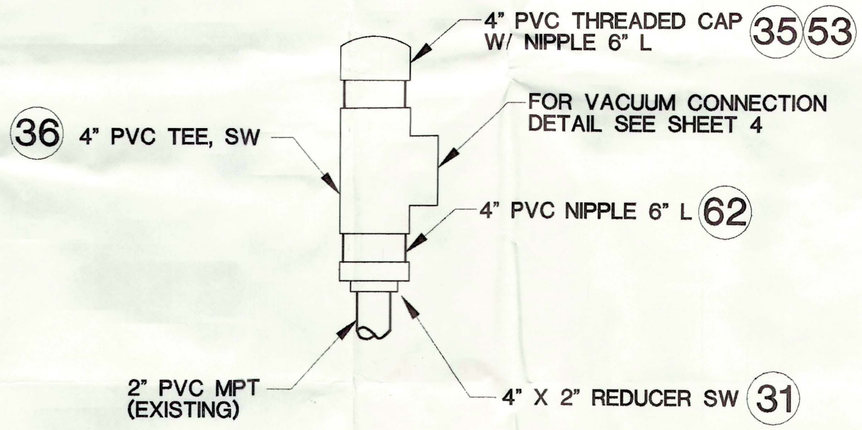


MANOMETER CONNECTION 6" HEADER



MANOMETER AND VACUUM CONNECTION 4" CROSS

USING THE EXISTING 2" WELL



VACUUM CONNECTION

USING THE EXISTING 2" WELL

REVISION B	CB	01/07/93
REVISION A	CB	12-18-92
Revisions	Chkd	Date

STA-RITE INDUSTRIES INC.
DELAVAN, WISCONSIN

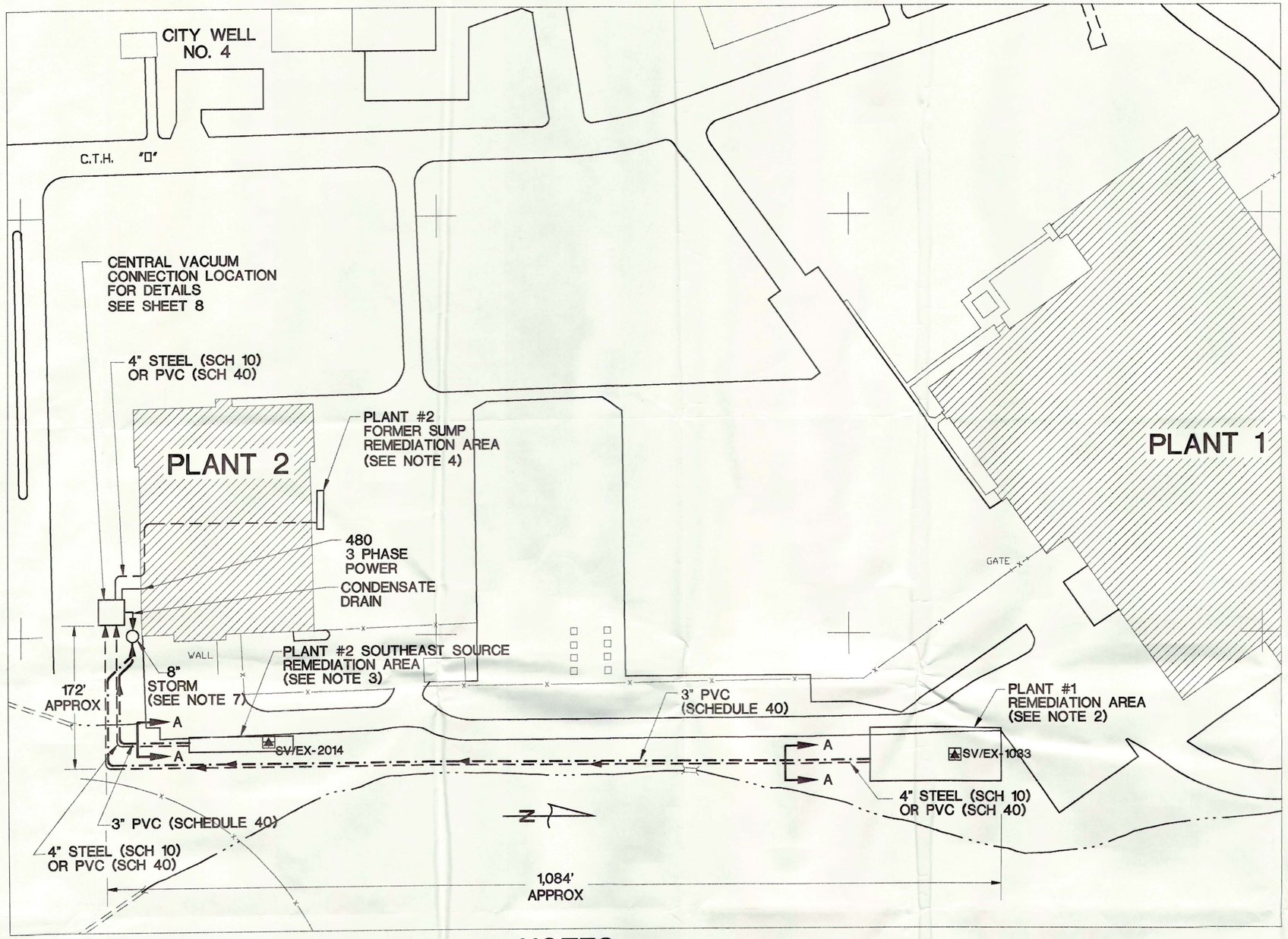
MANOMETER CONNECTION DETAILS

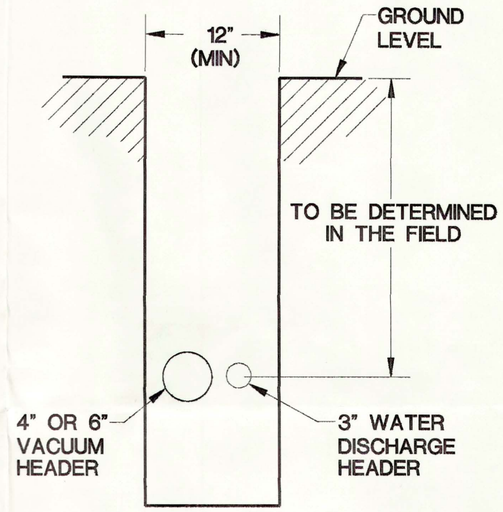
DATE:	10-25-92
DESIGNED BY:	
CHECKED BY:	
APPROVED BY:	
DRAWING NO:	1501-C42
PROJECT:	350115013

SIMON HYDRO-SEARCH
Brookfield Lakes Corporate Center XII
175 N. Corporate Drive, Suite 100
Brookfield, Wisconsin 53045

SHEET: 6 of 8

/hsi/15013/1501-C42





DETAIL A-A

TRENCH CROSS-SECTION

NOTES

1. THE PIPING SHOWN IS SCHEMATIC ONLY AND NOT TO SCALE. THE PIPING SCHEMATIC DOES NOT IMPLY OR SHOW ACTUAL ROUTING. ROUTING IS TO BE DETERMINED AT THE TIME OF FIELD INSTALLATION. OUTDOOR PIPING TO BE AT LEAST 3' FROM THE EDGE OF THE ROADWAY.
2. FOR SOIL VAPOR AND GROUND WATER EXTRACTION ISOMETRIC PIPING LAYOUT OF PLANT #1 SEE SHEET 1.
3. FOR SOIL VAPOR AND GROUND WATER EXTRACTION ISOMETRIC PIPING LAYOUT OF PLANT #2 TRUCK DOCK AREA SEE SHEET 3.
4. FOR SOIL VAPOR EXTRACTION ISOMETRIC PIPING LAYOUT OF PLANT #2 FORMER SUMP AREA SEE SHEET 2.
5. SEE DETAIL A-A THIS SHEET FOR TRENCH CROSS-SECTION AND ACTUAL LAYOUT OF VACUUM AND GROUND WATER PIPING.
6. SEE DETAIL B-B OF SHEET 8 FOR VACUUM HEADER PIPING CONNECTION TO MAIN SOIL VAPOR EXTRACTION UNIT(S).
7. SEE DETAIL C-C OF SHEET 8 FOR GROUND WATER DISCHARGE CONNECTION TO EXISTING 8" STORM DRAIN.

Revisions	Chkd	Date
REVISION B	CB	03/04/93
REVISION A	CB	12-21-92

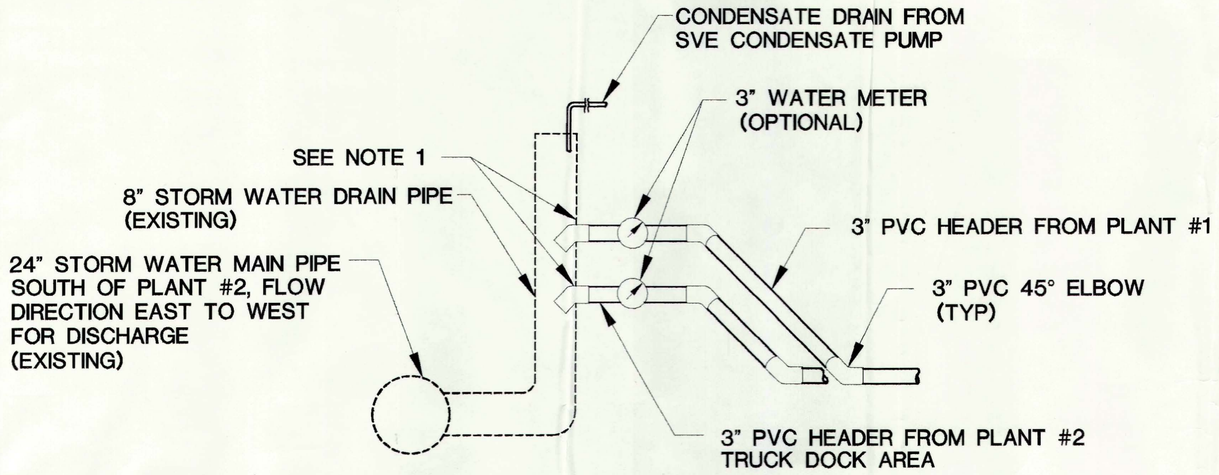
STA-RITE INDUSTRIES, INC.
DELAVAN, WISCONSIN

SITE LAYOUT REMEDIATION HEADER PIPING

SIMON HYDRO-SEARCH
Brookfield Lakes Corporate Center XII
175 N. Corporate Drive, Suite 100
Brookfield, Wisconsin 53045

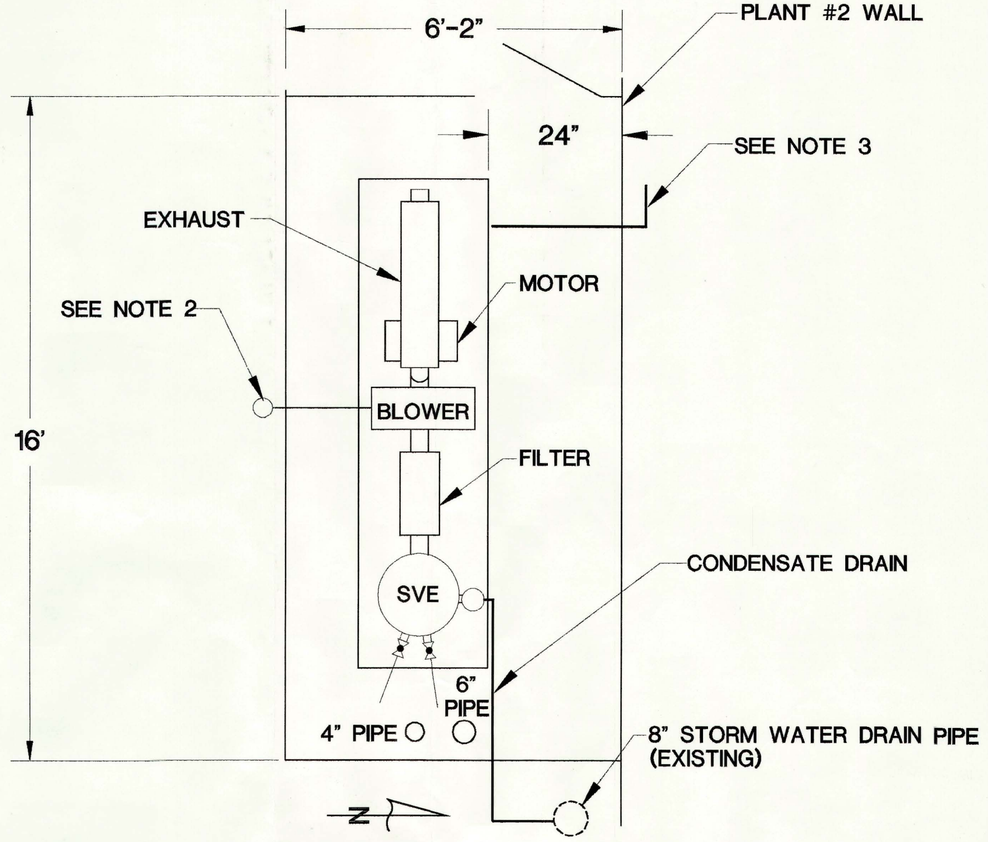
DATE:	12/14/92
DESIGNED BY:	
CHECKED BY:	
APPROVED BY:	
DRAWING NO:	1501-C66
PROJECT:	350115013
SHEET:	7 of 8

/hsi/15013/1501-C66



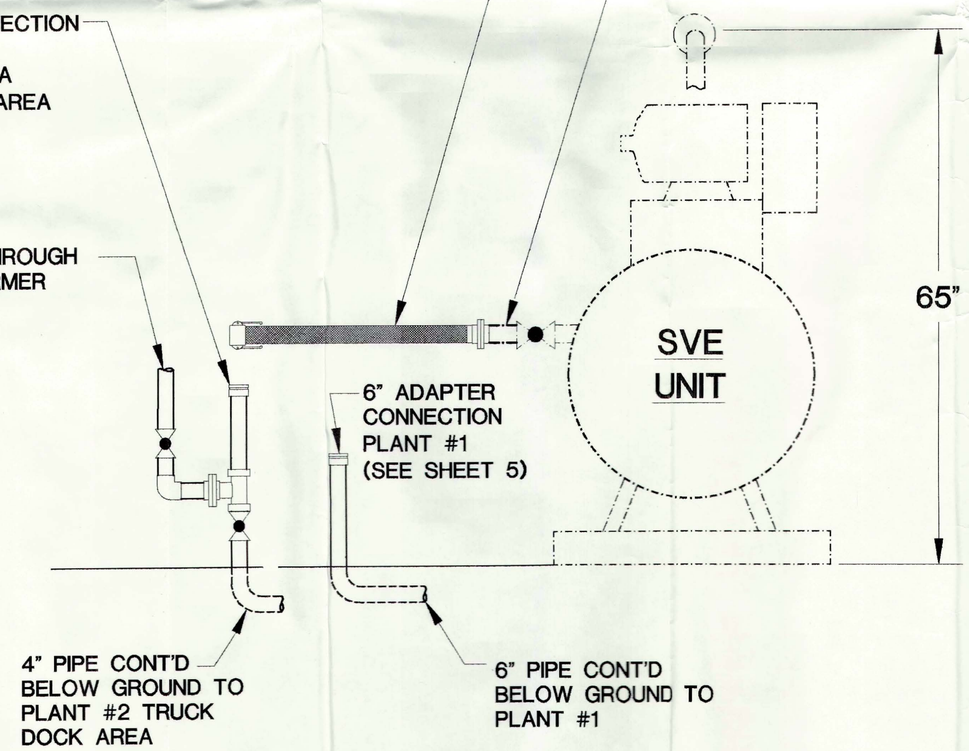
DETAIL C-C

WATER DISCHARGE MAIN LOCATION



SVE UNIT MAIN LOCATION ENCLOSURE

PLAN VIEW



DETAIL B-B

CONNECTIONS FOR SOIL VAPOR EXTRACTION UNIT

NOTES

1. DRILL THE 8" DIAMETER CONCRETE PIPE TO RECEIVE THE 3" SCHEDULE 40 PVC PIPE AND SEAL AFTER INSTALLATION WITH CAULKING OR QUICK GROUT. INSTALL A 90° OR 45° ELBOW TO POINT IN A DOWNWARD DIRECTION THEREBY AVOIDING UPWARD SPLASHING AND ALLOWING FOR CONVENIENT INSPECTION AND SAMPLING.
2. AIR DISCHARGE FOR BLOWER TO BE 12' ABOVE GROUND LEVEL
3. RUN ALL CONDUIT AND PIPING AT LEAST 6'-6" ABOVE GROUND LEVEL

REVISION A	WDNR	06/28/93
Revisions	Chkd	Date

STA-RITE INDUSTRIES INC.
DELAVAN, WISCONSIN

MAIN CONNECTIONS VACUUM AND GROUND WATER DISCHARGE

SIMON HYDRO-SEARCH
Brookfield Lakes Corporate Center XII
175 N. Corporate Drive, Suite 100
Brookfield, Wisconsin 53045

DATE:	12-17-92
DESIGNED BY:	
CHECKED BY:	
APPROVED BY:	
DRAWING NO:	1501-C65
PROJECT:	350115013
SHEET:	8 of 8

/hsi/15013/1501-C65