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April 24, 2008

Ms. Andrea Bain
State of Florida
Department of Environmental Protection
Bureau of Waste Cleanup, MS 4520
2600 Blair Stone Road
Tallahassee, FL 32399-2400

**Subject: UR Brite Cleaners
Response to Agency Comments
Remedial Action Plan Submittal – Final – Revision 1
Facility ID #069600002
Task Assignment #HW510-D12F**

Dear Ms. Bain:

Metcalf & Eddy, Inc. is providing this correspondence as a response to agency comments outlined in an internal memorandum dated February 8, 2008 from Mubeen Darji and addressed to your attention, and subsequent comment regarding the original final submission. Two copies of the revised final remedial action plan addressing each of the items below are attached.

Response to Agency Comments

Each item in the FDEP February 8, 2008 response memorandum has been reproduced below in italics. A response to each item follows in blue text.

Item 1 Section 5.1, RAP Checklist & Appendix F: There are inconsistencies in the text & the appendix regarding the use of an existing trailer. M&E needs to verify the availability of the SVE trailer and clarify this in the text and the costs.

The two trailers being considered for use at the UR Brite location are no longer available. The 15-hp trailer-mounted SVES (with VFD) coming off-line at Aristocrat is going to Holiday Plaza Cleaners and a 10-hp skid-mounted SVES coming off-line at No Spot is going to Norwood Cleaners. Costs for a new trailer have been included throughout the document.

Item 2 Section 5.1.2: is a design flow rate of 120 scfm per VEW well achievable? Please, have M&E verify the SVE design calculations using Johnson's equation for this site.

Step test data show that the blower can operate @ 120 CFM when using the 15-hp blower. This will still give us the required ROI. The Johnson's equations calculations using the design vacuum of 25" in wg at each well, the total flow rate of 360 scfm, and the data available from Elite cleaners is included in Appendix C, SVE Design Calculations.

Item 3 Section 5.1.2: An existing 15 hp SVE blower equipped with a variable frequency drive if available can be used at this site; however, if a new SVE blower has to be purchased for this site, then an appropriately sized blower should be specified.

The design requirement is 360 cfm at 67 in wg (includes 25% safety factor). We plan to use a 15-hp blower for the new trailer specification. A 10-hp blower would have to operate at the high end of the blower curve and would allow no safety factor.

Item 4 Section 5.1.2 & Figure 5: Soil boring SB010 the only location with an exceedance of 30 ug/kg of PCE is outside the area of influence of both VEW2 & VEW3. To adequately influence this contamination, VEW2 should be moved at least 10 feet to the south & VEW3 should be moved at least 10 feet to the east.

The actual estimated radius of influence has been recalculated to be 19 ft (the previous design ROI was 14 ft). This radius of influence captures the contamination adjacent to SB010 from both VEW-2 and VEW-3. This improves the coverage of the impacted area. We recommend only moving VEW-2, about 8 feet to the south to the center of the storefront. Figure 5, Appendix A – RAP Summary, Appendix D sheet C-1 and sheet C-4 of the construction drawings have also been revised to reflect the revised radius of influence, the VEW location, and VEW details.

Item 5 Section 5.4, 8, & Appendices A & F: The estimated construction costs and O&M costs for the first year are not consistent.

The costs in Section 5.4 and Appendix A were changed to match those in Section 8 and Appendix F.

Item 6 Section 7.4: In addition to quarterly sampling of the combined influent, it should also be sampled at startup, end of 1st week and end of 1st month. The effluent discharge should also be sampled at the end of the 1st week & the end of the 1st month.

The appropriate change was made.

Item 7 Figure 5: The units should be in “ug/kg” not “ug/l”.

The appropriate change was made. Other minor inconsistencies between the values in Table 2 and Figure 5 have been checked against the original laboratory data and were also corrected.

Item 8 Appendix D: Why is M&E proposing to sample the excavated soil stockpile for 8 RCRA metals?

No. 11, on page C-3 “General Description of Work” in Appendix D, is referencing the excavation of soils which is not included in the RAP scope of work and was included in error. This item was removed and subsequent items were renumbered accordingly.

Item 9 Typo: Typo on attached page should be corrected.

The typos in Section 2.6 (from the document that was attached) were corrected.

Item 10 Response to comments should be submitted prior to sending in the final document.

These comments were forwarded in an e-mail and agreed to prior to sending the final document.

In addition to the above changes, the project schedule detailed in Section 7.1 was updated to reflect revised start and finish dates. Also, references on the RAP checklist in Appendix A were updated.

Please contact me at (954) 745-7250 if you have any questions or require additional information.

Sincerely,

A handwritten signature in blue ink, consisting of the letters 'SB' followed by a long horizontal line.

Scott Buck, P.E.
Senior Project Manager



REMEDIAL ACTION PLAN

Soil Vapor Extraction Final

**Former UR Brite Cleaners
3230 N State Road 7
Lauderdale Lakes, Florida**

**FDEP Facility No. 069600002
April 2008**

METCALF & EDDY | AECOM

**REMEDIAL ACTION PLAN – Final
Soil Vapor Extraction System**

**UR Brite Cleaners
Facility ID #069600002
Task Assignment #HW510-D12F**

Submitted to:



State of Florida
Department of Environmental Protection
Hazardous Waste Cleanup Section
Tallahassee, Florida

Submitted by:

METCALF & EDDY | AECOM

Metcalf & Eddy, Inc.
Sunrise, Florida

April 2008

Prepared by:



Scott Buck, P.E.
Senior Project Manager

**REMEDIAL ACTION PLAN
Soil Vapor Extraction System**

**UR Brite Cleaners
Facility ID #069600002
Task Assignment #HW510-D12F**

P.E. CERTIFICATION

I hereby certify that in my professional judgment, the components of this report satisfy the requirements set forth in Chapter 62-782, FAC and that the engineering design features incorporated into the report provide reasonable assurances of achieving the objectives stated in Chapter 62-782, FAC for remedial action. However, I have not evaluated and do not certify aspects of this plan that are outside my area of expertise.



Scott D. Buck, P.E.
Registered Professional Engineer
Florida License No. 49923
Date: 4/16/8

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LIST OF ACRONYMS AND ABBREVIATIONS

ft bls	feet below land surface
CAR	Contamination Assessment Report
cis	cis-1,2-dichloroethene
DCE	dichloroethene
FAC	Florida Administrative Code
FDEP	Florida Department of Environmental Protection
GAC	granular activated carbon
GCTL	Groundwater Cleanup Target Level
M&E	Metcalf & Eddy, Inc.
µg/L	micrograms per liter
mg/L	milligrams per liter
NADC	Natural Attenuation Default Concentration
NELAC	National Environmental Laboratory Accreditation Conference
PCE	tetrachloroethene
RAP	Remedial Action Plan
SOP	standard operating procedure
TCE	trichloroethylene
trans	trans-1,2-dichloroethene
VOH	volatile organic halocarbons
VC	Vinyl chloride
VEW	Vertical Extraction Well
VMP	Vacuum Monitoring Point

Section 1

Introduction

Metcalf & Eddy, Inc. (M&E) has been retained by the State of Florida, Department of Environmental Protection (FDEP) to prepare a Remedial Action Plan (RAP) addressing contaminated soil at the former UR Brite Cleaners of Lauderdale Lakes. The drycleaner doing business as UR Brite (previously known as M&M Broward Coin) is located at 3230 N. State Road 7 in Lauderdale Lakes, Florida. The RAP was authorized under contract HW-510, Task Assignment HW510-D12F. The site has been assigned to M&E for state contracted cleanup.

1.1 Site Characteristics

The site is part of a small shopping plaza known as the Oakland Square Shopping Center, which is located in the northeast quadrant of the intersection of Oakland Park Boulevard and North State Road 7. The entire shopping plaza property is owned by Kimco Development Realty Corporation, 6100 West Glades Road, Suite 300, Boca Raton, Florida, 33434. A USGS site location map is included as **Figure 1**.

The tenant occupying the facility during site assessment activities had operated a small grocery store and Caribbean market for approximately six months. Currently, the facility is occupied by the Fancy Nails nail salon. Prior to the most recent tenant, the facility had been operated as an on-site drycleaner for at least 20 years, and perhaps over 30 years. According to a facility layout provided in the Site Screening Report (SSR), a single drycleaning machine, a spotter, and two presses were located towards the rear of the facility. No regular washing machines were identified; however, a coin laundry is in operation next door, on the north side of the former drycleaner.

The UR Brite facility occupied one of the smaller commercial spaces in the shopping plaza between two other small business spaces. The space on the north side is currently occupied by a coin laundry, and the space on the south side is occupied by a tax service business. The store front, or west side of the facility, is bordered by the asphalt drive and parking lot for the shopping plaza. Other businesses within the shopping plaza include a discount supermarket, appliance store, pawn shop, shoe store, and several smaller business spaces. No drycleaning facilities are currently in operation at the shopping plaza.

1.2 Site Assessment History

In September 1999, M&E conducted a contamination assessment and submitted a Contamination Assessment Report (CAR) to the FDEP. The CAR documented the evidence of chlorinated solvent-impacted groundwater. Based upon the CAR, the FDEP recommended monitored natural attenuation (MNA) as the remedial strategy for the dissolved contaminant plume. Since submittal and approval of the MNA plan, the following activities have been completed.

- The first quarterly monitored natural attenuation (MNA) sampling event was conducted on August 13, 2001. Sampling was conducted on a quarterly basis during the first year and annually for years 2 and 3.

- The Year 3 MNA sampling event revealed that tetrachloroethene (PCE) concentrations in monitoring well MW001 had increased in every sampling event since the site assessment (1999). Therefore, M&E proposed advancing a network of six soil borings intended to identify a leachable source of PCE. The FDEP tasked M&E to conduct a supplemental soil assessment to determine the extent of residual vadose zone contamination which could be affecting the local groundwater. Samples were collected at varying depths from 6 soil borings and laboratory analytical results indicated elevated PCE concentrations in one of the soil samples. A Remedial Action Plan was recommended to FDEP to address vadose zone soil contamination and enhance groundwater remediation.
- The Year 4 MNA results indicated a slight decrease in PCE concentrations when compared to the previous three years of laboratory results. Further discussion regarding Remedial Action Plan Implementation was postponed until additional MNA results were reviewed.
- In both the Year 5 and Year 6 MNA sampling events, M&E continued to sample two monitoring wells to assess the current nature and distribution of on-site groundwater contamination. Results for both PCE and TCE were slightly elevated when compared with Year 4. M&E subsequently, recommended continued MNA sampling and the development of a Remedial Action Plan to address the vadose zone contamination.

The proposed treatment method for soil remediation is a soil vapor extraction system (SVES). The goal is to remediate residual soil concentrations which are potentially contributing to groundwater concentrations above the Maximum Contaminant Levels (MCLs). The purpose and intent of the SVES RAP is to present the basis and design for a full-scale soil remediation system, as well as provide construction drawings for sub-contracted design/build implementation. The cleanup target levels for remediation are those listed for groundwater in Table 1 and leachability of soils in Table 2 of Chapter 62-777 (effective date of April 15, 2005) of the Florida Administrative Code and indicated in the table below.

Cleanup Target Levels	GCTL	Units	SCTL	Units
Tetrachloroethene	3	µg/L	30	µg/Kg
Trichloroethene	3	µg/L	30	µg/Kg
Cis-1,2-Dichloroethene	70	µg/L	400	µg/Kg
Trans-1,2-Dichloroethene	100	µg/L	700	µg/Kg
Vinyl Chloride	1	µg/L	7	µg/Kg

GCTL : Groundwater cleanup target levels FAC Chapter 62-777, Table 1

SCTL : Soil cleanup target levels for leachability based on groundwater criteria FAC Chapter 62-777, Table 2

µg/L : micrograms per liter

µg/Kg : micrograms per liter

The RAP Summary Sheet and Checklist are included as **Appendix A**.

Section 2

Site Geology and Hydrogeology

This Site Geology and Hydrogeology section includes geological data collected from historical and recent events. Figures from the Contamination Assessment Report completed in 1999 relevant to this Remedial Action Plan are included in **Appendix B**.

2.1 Well Survey

According to Broward County Well Field Protection Zone Maps, this site is located within 0.25 mile of the maximum protection area for the Broward County Public Works Department, Office of Environmental Services, District 1A Well Field. There are nine Biscayne aquifer production wells associated with this well field and at least six of them appear to be within 0.5 mile. The well depths range from 94 to 200 feet bls with casing depths that range from 69 to 89 feet bls. Total design operational yields for the well field are rated at 19,500 gallons per minute (gpm), which equates to a capacity of over 28 million gallons per day (mgpd). However, actual operational yields are closer to 15,000 gpm, or approximately 21.6 mgpd.

The closest production wells are # 3 and # 4, which are located along the southern boundary of the Broward County water treatment facility property (on the west side of N. State Road 7 and just north of NW 36th Street). According to specific well data provided by the Broward County Environmental Operations Division, the total depth of each well is 100 feet bls with casing depths of 89 and 76 feet, respectively. Design operational yields are rated at 1500 gpm, which equates to a capacity of over 2 mgpd for each well. Actual yields are 989 gpm (1.4 mgpd) for well # 3 and 1286 gpm (1.9 mgpd) for well # 4.

The most significant nearby wellfield is the one designated to the City of Lauderhill. The closest wellhead is approximately 1.25 miles southwest of the former drycleaner, and the edge of the maximum protection zone is depicted as reaching within just less than 1 mile of the former drycleaner.

2.2 Private Well Survey

The Oakland Square Shopping Center irrigation system is supplied by an on-site well, located in one of the landscaped areas of the parking lot, approximately 200 feet south-southwest of the front door of the former drycleaner. Construction details for the irrigation well were not available from the current property owner. No small public or other private wells were identified within 0.25 mile of the former drycleaner.

The closest residential area to the site is located approximately 750 feet to the east. No private water supply wells were observed in this neighborhood; however, the existence of several private irrigation wells would not be unusual.

2.3 Surface Water Survey

The nearest surface water body is a canal, which lies just over 1,000 feet northeast of the former drycleaning facility. This feature is identified on the aerial photograph provided in **Appendix B**.

2.4 Utility Survey

Prior to field activities, M&E contacted an underground utility location service to locate water supply, sanitary sewer, telephone, natural gas and electric utilities in the vicinity of the site. Through the utility location service, telephone, water supply and electric lines were identified as entering the shopping plaza property from Oakland Park Boulevard, which borders the property to the south. Water is supplied to the site by Broward County Environmental Services District 1. Although as-built drawings were not available from the county or property owner, a private underground utility location firm was brought in to confirm the location of all utilities relative to the proposed sampling locations. A site plan, which illustrates pertinent underground utilities, is included in **Appendix B**.

2.5 Site Geology

On April 26, 1999, a standard penetration test (SPT) soil boring was advanced to a refusal depth of 72 feet bls. This boring (SPT-1) was placed in the asphalt parking lot, along the front of the site building, approximately 120 feet north of the front door for the former drycleaner facility. On May 5, 1999, a second boring (SPT-2) was conducted to 30 feet bls in the driveway directly outside the back door of the former drycleaner. Split-spoon samples were collected at continuous 2-foot intervals to the boring termination depths. Lithological descriptions from the SPT logs indicate the surficial geology at this site consists of predominantly fine-grained to medium-grained sands from land surface to at least 70 feet bls, the refusal depth of SPT-1. A mixture of both quartz and carbonate grains were observed in the sands encountered beneath this site. At SPT-1, a noticeable increase in silt content and a higher ratio of carbonate to quartz sand were encountered at approximately 49 feet bls and continued to the refusal depth. In addition, traces of shell material were observed between 14 and 35 feet bls.

2.6 Site Hydrogeology

A professional survey of the site was initiated on May 21, 1999, to identify the locations and elevations of all groundwater monitoring wells and sample collection points. The survey data, in conjunction with well gauging data collected from the newly installed microwells, were evaluated to determine the approximate direction and magnitude of the groundwater gradient across the site. A site-specific water table elevation map based on the most recent gauging event (January 17, 2007) is provided as **Figure 2** and confirms a potentiometric gradient to the northeast. The water table elevation data are summarized in **Table 1**.

Due to the lack of any 2-inch diameter or larger groundwater monitoring wells at this site, no slug tests could be performed to determine estimated hydraulic conductivity values for the surficial aquifer beneath the site. Instead, an estimated hydraulic conductivity value of 50 ft³/day/ft² was derived from WRI Report #87-4304, Hydrogeology/Aquifer Characteristics and Groundwater Flow of the Surficial Aquifer System – Broward County.

The water table hydraulic gradient (i_x) was calculated using the following equation:

In general $i_x = g_x/d_x$

Where i_x = hydraulic gradient
 g_x = water table elevation differential = 0.09 ft
(between gradient contours, MW005 and MW002)
 d_x = distance between gradient contours = 90 ft

Therefore $i_x = 0.09 \text{ ft} / 90 \text{ ft} = 1 \times 10^{-3} \text{ ft/ft}$

The horizontal groundwater velocity (v_x) was calculated using the following equation:

In general $v_x = K*i_x/\eta_e$

Where v_x = groundwater velocity
 K = hydraulic conductivity = 50 ft/day
 i_x = hydraulic gradient = $1 \times 10^{-3} \text{ ft/ft}$
 η_e = estimated effective porosity = 0.30 (Driscoll, 1986)

Therefore $v_x = (50 \text{ ft}^3/\text{day}/\text{ft}^2 * 1 \times 10^{-3} \text{ ft/ft}) / 0.30 = 0.167 \text{ ft/day}$

The vertical hydraulic gradient (i_z) was calculated using the following equation:

In general $i_z = g_z/d_z$

Where i_z = vertical hydraulic gradient
 g_z = water table elevation differential at cluster wells = 0.02 ft
(between MW001 and MW002)
 d_z = distance between screened intervals at cluster wells = 11 ft
(between MW001 and MW002, ft bls)

Therefore $i_z = 0.02 \text{ ft} / 11 \text{ ft} = 0.002 \text{ ft/ft}$

The vertical groundwater velocity (v_z) is calculated by estimating the vertical hydraulic conductivity to be approximately one tenth of the horizontal hydraulic conductivity and using the following equation:

In general $v_z = 1/10*K*i_z/\eta_e$

Where v_z = vertical groundwater velocity
 K = hydraulic conductivity = 50 ft³/day/ft²
 i_z = vertical hydraulic gradient = 0.002 ft/ft
 η_e = estimated effective porosity = 0.30 (Driscoll, 1986)

Therefore $v_z = (1/10*50 \text{ ft}^3/\text{day}/\text{ft}^2 * 0.002 \text{ ft/ft}) / 0.30 = 0.03 \text{ ft/day}$

The average depth to the groundwater table during this assessment was approximately 7 ft bls with an estimated annual variation of approximately 1 to 3 ft.

Section 3

Contamination Assessment Summary

This Contamination Assessment Summary includes data from the Contamination Assessment Report submitted in 1999, the Monitored Natural Attenuation events for the last six years, and the Supplemental Site Assessment Report conducted in 2004. Pertinent figures from the Contamination Assessment Report describing the site geology and hydrogeology are included in **Appendix B**. Historical soil data is presented in **Table 2**. Historical and recent groundwater data is presented in **Table 3** and is depicted in **Figure 3** and **Figure 4**. Historical soil data and the soil boring locations are depicted on **Figure 5**.

3.1 Contamination Assessment Report (1999)

In May 1999, a total of 47 groundwater samples (including QA/QC samples) were collected from 11 direct push locations, four soil borings (SB001 through SB004) were installed in order to collect soil samples from a depth of approximately 2 feet bls, and six permanent microwells were installed and sampled. Limited evidence of the presence of PCE and/or TCE and their degradation products was detected in the groundwater and soil beneath the site. The highest concentrations observed and reported were as follows:

- 1.4 µg/l PCE in DP003 at 20 feet bls (MW005 location in front of facility).
- 13.9 µg/l TCE in DP001 at 12 feet bls (under slab near drycleaning machine).
- 24.2 µg/l cis-1,2-DCE in MW001 (near back door of facility).
- 32.4 µg/l trans-1,2-DCE in MW001 (near back door of facility).

Vertically, the affected groundwater appears to have migrated to a depth of 30 feet bls directly beneath the facility at DP001 and DP007/MW002. The location of these highest concentrations and the trends inferred from data collected suggest the possibility of one source area near the drycleaning machine (at DP001) and/or the rear of the facility. Monitored natural attenuation monitoring was the recommended treatment strategy.

3.2 Monitored Natural Attenuation - Year 1 through Year 6

Six years of Monitored Natural Attenuation (MNA) has been conducted at the site. During Year 1, M&E collected groundwater samples from 5 monitoring wells: MW001 (source), and MW002 (cross-gradient), MW006 (northwest of property), MW007 (down-gradient, shallow), and MW008 (down-gradient, intermediate). Concentrations of all sampled constituents in monitoring wells MW006, MW007, and MW008 were below detectable levels and subsequently these wells were not sampled in future MNA events. Increasing concentrations of PCE in MW001 in Years 1, 2, and 3 led to the sampling of MW007 in Year 4, and to the completion of a supplement soil assessment report in an attempt to identify an unsaturated zone source. All contaminants concentrations in MW007 were below detectable levels. Levels decreased slightly in Year 4 for MW001 and rebounded again in Years 5 and 6, while concentration in MW002 continued to be below detectable levels. For Year 6, PCE and TCE were detected at concentrations of 11.4 µg/l and 3.26 µg/l respectively in monitoring well MW001. This was slightly higher than the Year 5 results for PCE of 5.89 µg/l and TCE of 2.91 µg/l. No other contaminants of concern have been detected in any of the monitored natural attenuation events.

3.3 Supplemental Site Assessment Report (2004)

FDEP tasked M&E to conduct a supplemental soil assessment to determine the extent of residual vadose zone contamination which could be affecting the local groundwater. M&E collected soil samples at two, four and six feet below land surface (BLS) from six soil borings located inside and in the vicinity of the back entrance to the former dry cleaning facility. Laboratory analytical results indicate the presence of elevated PCE in only one soil sample exceeding the FDEP SCTL for leachability based on groundwater criteria of 30 micrograms per kilogram ($\mu\text{g/Kg}$). Soil sample SB010 collected at 6 feet BLS yielded a PCE concentration of 42 $\mu\text{g/Kg}$; however, subsequent VOH analysis utilizing the synthetic precipitate leachate procedure (SPLP) extraction did not detect any leachable PCE above a detection limit of 1 $\mu\text{g/l}$. All other soil sampling locations indicated the presence of PCE below the FDEP SCTL or below an analytical detection limit of 3 $\mu\text{g/Kg}$.

M&E recommended that the decision memorandum be revised to include soil vapor extraction (SVE) as the recommended method for soil remediation and enhancement of groundwater remediation. Based on the relatively large area of influence achievable from an in-situ SVE system, it is likely that the majority of VOH-impacted soils would be addressed with a properly designed SVE system. In addition, M&E recommended continued annual groundwater natural attenuation monitoring since contaminant concentrations remain well below the Natural Attenuation Default Concentrations (NADCs) and barely exceed GCTLs

3.4 Baseline Groundwater Sampling

On January 17, 2007 baseline groundwater samples were collected from MW001 (source) and MW002 (cross-gradient). The analytical results indicate that the only contaminants of concern that exceeded GCTLs were PCE and TCE. For the baseline sampling event, PCE and TCE were detected at concentrations of 6.39 $\mu\text{g/l}$ and 6.36 $\mu\text{g/l}$ respectively in monitoring well MW001. No other contaminants of concern were detected. Again, the site conditions continue to vary slightly from previous sampling events with the PCE results being down from the Year 6 MNA sampling (11.4 to 6.39 $\mu\text{g/l}$), while the TCE concentrations were slightly higher (3.26 to 6.36 $\mu\text{g/l}$).

3.5 Initial Source Removal

Initial source removal actions with regard to dry cleaning operations or dry cleaning solvent contamination have not been performed at this site.

Section 4

Remedial Alternatives Evaluation

Based on the data collected during the contamination assessment and subsequent natural attenuation monitoring events, and what is known about the mobility of volatile organic halocarbons (VOHs), it is reasonable to assume that the identified soil contaminant plume may currently be or become a human health exposure risk via the soil leachability and volatilization pathways.

M&E recommended the installation of a Soil Vapor Extraction System (SVES). Soil vapor extraction is an in-situ process designed to remove volatile organic compounds (VOCs) from the vadose zone. The process requires the use of one or more vapor extraction wells (VEWs) to remove vapors from the subsurface by means of a vacuum induced by a blower. A concentration gradient is formed between the absorbed and vapor-phase constituents, which drives desorption. The resulting vapor extracted at the VEWs is then sent to a treatment system where the contaminant is absorbed in carbon canisters until regulatory emission levels are met.

The SVES was selected as the remedial approach for soil because it is less intrusive than excavation. The area of saturated zone contamination is of limited extent. The soil type in the impacted zone is conducive to SVE and the technology has been effective in remediation of drycleaning solvent impacted soils at numerous sites in South Florida. Additionally, this recommendation is based on the fact that the sole soil contaminant is PCE which is sufficiently volatile. Based upon past experience with similar sites, the estimated time for cleanup of the impacted soil is one year.

Section 5

SVES System Design

5.1 System Design

The proposed soil vapor extraction system (SVES) is based upon an existing FDEP mobile SVES trailer currently in use at other dry cleaner sites (Alan Cleaners Facility No. 9501755, One Hour Martinizing Facility No. 9502196, Nu-look Cleaners Facility No. 9501945, and Classic French Cleaners Facility No. 9500171). It should be noted that no SVES pilot test has been conducted at UR Brite of Lauderdale Lakes and the proposal of this system is based solely on relatively similar subsurface conditions (equivalent hydraulic conductivity values determined from literature) and experience at the referenced sites.

5.1.1 System Layout

The proposed system layout is based on site constraints. A total of three VEWs will be required to provide vacuum capture in the area of impacted soil. The location of two of the VEWs will be inside of the building to the west of the rear entry doorway, and the other VEW will be located about 5 feet east of the doorway.

5.1.2 Radius of Influence

The vacuum and radius of influence achievable at a site is a function of the blower size but also of numerous site-specific conditions such as soil type, surface seal, presence of compacted backfill under a building, and preferential pathways or short circuiting created by underground utility corridors. An applied wellhead vacuum of approximately 25" wg and an operational effective flow rate of 120 scfm for each VEW were calculated. The radius of influence based on the design flow rate of 120 scfm for each VEW is estimated to be approximately 19 feet. Based upon the data presented, the use of the three vertical extraction wells to capture the entire plume appears to be possible. The design applied wellhead vacuum and flow rate values were calculated from pilot study data collected from Elite Cleaners (Facility ID No. 9500842). The pilot test data from Elite Cleaners as well as the SVES design calculations are provided for in **Appendix C**.

The specified blower for the SVES is a Rotron model EN909BG72WL regenerative blower equipped with a 3-phase 15 hp motor. As the blower motor will be equipped with a variable frequency drive, M&E recommends optimizing the system as site conditions dictate, such as lowering the flow rate during the wet season (high water table) and increasing the flow rate (vacuum) in the dry season (low water table). Previous pilot study data and actual operational experience demonstrate maintenance of effective radii of influence as a result of these seasonal applied vacuum and respective flow rate variations. As a part of routine operational monitoring, applied and induced vacuums, respective flow rates and achieved radii of influence from the VEWs will be monitored and evaluated for overall remediation progress and effectiveness. The system will have valves placed in such a manner that the wells may be alternated or used concurrently depending on the observations made during remediation.

Refer to **Figure 5** for the estimated radius of influence and location of all VEWs. Preliminary construction plans illustrating the locations of the proposed VEW, mobile trailer, and piping

layout are provided in **Appendix D**. The proposed process flow diagram and equipment layout is also illustrated in **Appendix D**. Refer to **Appendix E** for component specifications.

5.2 Safety Measures

As a safety precaution, several conditions would cause the entire vapor extraction system to shut down. The following are the conditions:

Vapor extraction blower malfunction: The vapor extraction will automatically shut down should the blower pull high amperes, so as not to cause adverse effects to the motor. Breakers will be installed in the control panel and will trip in the event of high amperes drawn on the blower. The entire system would then be manually restarted.

Blower overheating: The vapor extraction blower will automatically shut down should internal thermal overload exceed the factory set limits, so as not to cause adverse effects to the motor. The entire system will then automatically be restarted when the temperature returns to normal operating conditions.

High water in air/water separator: A high level probe will be installed in the air/water separator. Should the probe be activated, the entire system would shut down so as not to pass water through the vapor extraction blower. The system would then be manually restarted.

5.3 Vapor Emissions

The halocarbon vapors extracted from the VEWs will be treated for a minimum of 30 days after system startup, pursuant to air emissions guidelines as established by FDEP. A single air purifying granular activated carbon (GAC) unit will treat the VEH vapors prior to atmospheric discharge. Following the minimum 30-day treatment and attainment of discharge standards, the effluent will be discharged directly to the atmosphere.

The radial flow carbon treatment unit (Tetrasolv VR-140) has been sized for an airflow capacity of 360 cubic feet per minute (cfm) and to accommodate the maximum expected contaminant concentrations. The 140-pound vessel will be placed on the influent side of the blower to minimize temperature effects and after the air/water separator to minimize moisture. The carbon treatment unit will have influent and effluent sample ports. Unit specifications are provided in **Appendix E**.

Based upon experience at similar sites, extracted vapors will have a concentration 10 to 30 mg/m³ of PCE at startup. Following the first year of operation, the system influent is projected to be below detectable concentrations (0.5 to 1 mg/m³). Additionally, due to the limited mass of contaminant (0.012 pounds of PCE), carbon canister sizing, and repetitive sampling at startup, the risk of VEH discharge to the atmosphere in exceedance of the hazardous air pollutant standards (daily maximum of 5.5 pounds per contaminant compound or 13.7 pounds total per day for all compounds, per Hartsfield Memo, March 13, 2000) is minimal. Maximum Allowable Concentrations (MAC) can be computed using the FDEP air emissions model, "T-Screen", for verification should the FDEP require. The discharge height will be a minimum of 15 feet above grade to prevent or minimize potential odor problems. Upon exhausting the carbon drum or completion of soil remediation, the carbon will be properly profiled, manifested, and transported offsite for proper disposal.

5.4 Cost Estimate

Pricing is based on subcontracted installation with oversight by M&E. This estimate does not constitute nor is it expected to be construed as the actual cost. Actual capital costs should be

estimated by the subcontractor from completed permit drawings. The engineer's estimate of probable construction cost for the SVES is \$115,000. An estimated operation and maintenance cost over the first year for the SVES is \$32,000. Purchase of a new SVE trailer is included. Leasing of the SVES equipment is not cost effective based on re-use at subsequent sites. A rough order magnitude (ROM) engineering estimate for implementation and one year of operation and maintenance of the proposed system is included in **Appendix F**.

Section 6

Construction Details

6.1 Coordination

M&E will coordinate with the site and adjacent property owners before and during construction activities to ensure minimal disruption to normal operations. Any adjustments to utilities associated with construction activities will be coordinated so that service interruptions occur during off-peak periods or outside of standard working hours. Prior to installation of the system, utilities will be located through the Sunshine State Call One Center and its member utilities, and by a private utility locator using ground penetrating radar. Permitting and regulating agencies will be contacted as applicable to avoid unnecessary construction delays.

6.2 Construction Drawings and Permitting

Preliminary construction drawings that depict standard civil, mechanical, and structural details for the remediation system are provided in **Appendix D**. Drawings are not for bidding or estimate purposes. Final permit drawings will be prepared when the RAP is approved by the FDEP, and permitting and system construction have been tasked.

Prior to system construction, applicable permits, including building, plumbing, and electrical permits will be secured by M&E's sub-contracted General Contractor (GC). Upon completion of construction and within 120 days from approval of the RAP, record drawings including electrical diagrams, signed and sealed by a Florida Registered, Professional Engineer, will be forwarded to the FDEP.

6.3 Construction Standards

Underground work will comply with the Florida Trench Safety Act (Sections 553.60-553.64, F.S.) and Underground Facility Damage Prevention and Safety Act (Sections 556.101-556.111, F.S.) as stated in the requirements of the contractor in the Permit Drawings. The handling, storage, transporting and disposal of hazardous wastes shall be conducted in accordance with Chapter 62-730, FAC. Health and safety procedures will be implemented in accordance with OSHA standards specified in Title 29 CFR, and as required by the Contractor. In accordance with these permits and the requirements of the State of Florida, all electrical, plumbing, construction, and excavation will be performed in accordance with Chapter 489 and 553, Florida Statutes

6.4 Vapor Extraction Well and Vacuum Monitoring Points

Three 4-inch diameter VEWs constructed of schedule 40 PVC with a 0.020-inch slot and high flow PVC screen with a vertical screened interval of 5 feet and at a total depth of 6 feet bls will be utilized in close proximity to the area of greatest known soil contamination, as shown in **Figure 5**. Three vacuum monitoring points (VMPs) will be installed at strategic locations and varying distance from the VEWs to monitor system influence during operation. The three VMPs will be constructed of one-inch diameter schedule 40 PVC with a 0.010 inch slot and a screened interval of 1 to 6 feet bls with a total depth of approximately 6 feet bls (approximately one foot above the water table). Refer to **Figure C-2, Appendix C** for VEW and VMP construction details.

6.5 Vapor Extraction Well Piping

The 3-inch schedule 40 PVC VEW piping will be routed underground to the mobile SVES enclosure. This piping will be sloped back to VEW-1, VEW-2, and VEW-3 to inhibit the accumulation of groundwater in the transfer piping and air/water separator. Prior to backfill of the trenches, all underground pipes will be pressure tested. Refer to **Appendix D** for the proposed VEW, treatment system, and piping locations.

6.6 Electrical

A transformer capable of supplying the 208-volt, 3-phase power required to operate the mobile SVES trailer is available behind the property and is currently providing service to an electrical room located in the alley. An overhead drop from this location to the remediation trailer will be provided to address power needs. All motor starters, surge protection and fuses will be located in the equipment control panel on the exterior of the trailer. Since this is a SVES system, telemetry is not considered a necessary expense item. Electrical design and construction shall follow the National Electrical Code (NEC) and other local code requirements. The trailer will be certified by Underwriters Laboratory (UL) for use at UR Brite of Lauderdale Lakes.

6.7 Treatment System Trailer

The vapor extraction system will be housed in a locked and secure equipment trailer at a location shown in **Appendix D**. The purpose of the trailer is to contain and protect the remediation system equipment at the site. The system will be protected by drum barriers with reflective paint and will be placarded, in accordance with Chapter 62-730, FAC, with a standard FDEP sign providing the facility ID number and emergency phone number.

Refer to the following table for M&E's noise measurement obtained on June 23, 2004 at Artcraft Cleaners (Facility ID No. 9502146), where a similar site SVES operated. The measurements were collected at 10-second intervals, with a total of 100 measurements taken of background conditions and another 100, of conditions with the blower running at full power. All measurements were collected at a distance of twenty feet from the trailer on the side of the exhaust vent.

Ambient Background (dB)	% of Measurements	Blower Operational (dB)	% of Measurements	Difference (dB)
63	7	68	3	+5
64	52	69	10	+5
65	30	70	48	+5
66	6	71	26	+5
67	5	72	6	+5
		73	5	
Average difference between ambient background and blower operation				+5

Section 7

Operation & Maintenance Details

7.1 Schedule

Refer to the following table, which documents the estimated schedule to implement the proposed remediation system.

Task Assignment	Duration	Estimated Start Date	Estimated Finish Date
Receive Task Assignment		August 1, 2008	
Prepare Permits	2 weeks	August 1, 2008	August 15, 2008
Conduct Permitting	8 weeks	August 15, 2008	October 15, 2008
Procure Remedial Equipment, Construction Mobile SVES	10 weeks	August 1, 2008	October 15, 2008
Construct System	2 weeks	October 15, 2008	November 1, 2008
Start-up	1 week	November 1, 2008	November 8, 2008

7.2 Start-up Testing

During start-up procedures, the following items will be tested to ensure installed vapor extraction components are operating within acceptable parameters.

- Check vacuum gauges, on process flow lines and VEW for proper operating vacuum.
- Check VMPs for design influence.
- Verify that blower amperage is within acceptable ranges.
- Check high water level probe and pressure relief valve in air/water separator to ensure proper operation.
- Evaluate vapor samples for predicted GAC breakthrough time.

7.3 System Mechanical Monitoring

To minimize equipment breakdowns and related repair costs, the vapor extraction system will be monitored one week after start-up and monthly thereafter until the completion of remediation. Regular maintenance will minimize potential repair costs and ensure system efficiency is maintained. Listed below are those items that will be routinely inspected during scheduled maintenance checks.

- Check all system vacuum, pressure, flow, and temperature gauges for proper operation.
- Check VMPs for influence.
- Check air water separator high water level probe to ensure it is operational and remove any accumulated water into 55-gallon drums for storage and disposal.
- Check vacuum relief valve to ensure it is operational.

- Check temperature gauges for overheating.
- Check hour meter for continuous system operation.

7.4 Environmental Monitoring

To assure proper remediation system operations, the following data will be collected at start-up and on a quarterly basis until system shutdown. Appropriate quality control samples will be taken in accordance with Chapter 62-160, FAC.

- At system start-up, SVES air samples will be collected from each of the VEWs (VEW-1, VEW-2, and VEW-3) influent lines prior to the carbon vessel (influent), and from the effluent discharge. A single combined influent sample and an effluent sample will be collected at the end of the first week and the end of the first month. All samples will be analyzed for PCE and associated drycleaning VOHs by SW-846 8260B.
- A single combined influent air sample will be collected on a quarterly basis thereafter. It is assumed that the off-gas treatment will only be required for the initial 30-day period. The samples will be analyzed for PCE and associated drycleaning VOHs by Method SW-846 8260B for the purpose of monitoring off-gas emission rates for air emission compliance. Additionally, this data will be used for calculating the overall system mass removal effectiveness monitoring.
- Applied vacuum at the VEW and induced vacuum VMPs.
- Flow rate from each extraction well.

7.5 System Reporting

Subsequent to successful system start-up, M&E will prepare a start-up report. This report will document the following.

- Construction procedures.
- Changes in system layout if applicable.
- The results of environmental quality analyses, including the determination of attainment of off-gas hazardous air pollutants standards.
- System effectiveness with respect to radial influence.
- Signed and sealed record drawings.

Subsequently, M&E will submit quarterly reports. These reports will contain the following information.

- Analytical results.
- System flow rates, applied vacuum, and induced vacuum readings.
- Vacuum contours depicting system capture zone which is defined by 0.1 inch of water column vacuum terminus.
- Operational status of major equipment.
- Percentage of system runtime.
- Summarization of data in FDEP standard forms.
- Conclusion as to the effectiveness of the active remediation system.
- Recommendations for continuation or modification of the remedial system and monitoring program.

7.6 Determination of Remediation Completion

Remediation will be considered complete when confirmatory soil samples indicate attainment of the Soil Cleanup Target Level for Leachability based upon the Groundwater Criteria. Based on experience at similar sites, attainment of this goal is expected to take approximately six months to one year of SVES operation. Confirmatory soil borings will be collected following one year of operation, if SVE analytical data indicates that SCTLs may have been achieved.

Section 8

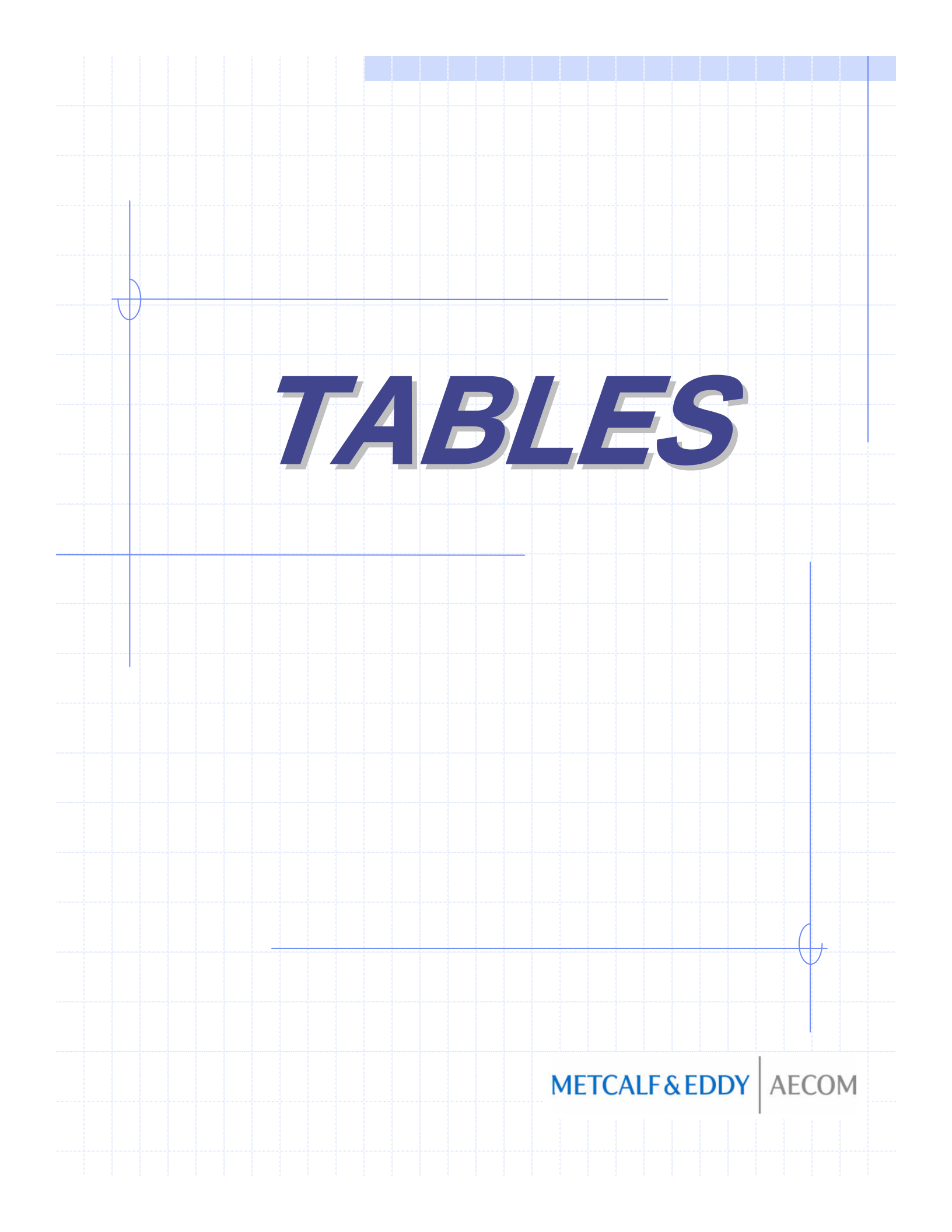
Conclusions

Assessment of this facility identified the presence of VOH impacted soil which exceeds the leachability standards established in FDEP's Soil Cleanup Goals for Florida. The selected treatment method for soil remediation is vapor extraction.

The SVES RAP proposes a vapor extraction system, which will use three vertical extraction wells and a regenerative blower. The vapor extraction system total design flow rate is 360 scfm at approximately 25 in wg applied vacuum at each wellhead and a radius of influence of 19 feet for each VEW, based upon pilot test and full scale operational data from other 15-hp SVES sites. These design values are approximate and flow rate, applied vacuum, and radius of influence values will depend on site-specific conditions. Each VEW will be constructed of 4-inch diameter schedule 40 PVC with a 0.020 inch slot and high flow screen. The vertical screened interval of each VEW will be 5 feet with a total well depth of 6 feet bls. Vapor off-gas treatment will be provided by a single carbon unit connected on the suction side of the SVE system.

The sampling program proposed in this SVES RAP will be followed to monitor the progress of the remediation system. Collected data will be compiled into quarterly annual reports for the FDEP's review. Based on these reports, system efficiency will be evaluated and modifications proposed as required.

The engineer's estimate of probable construction cost is \$115,000. Estimated operation and maintenance cost over the first year are \$32,000.



TABLES

TABLE 1
MONITORING WELL INVENTORY AND WATER TABLE ELEVATION DATA

POINT ID	TOC ELEV. (NAVD-88 feet)	SCR. INT. (feet bls)	Diameter (inches)
MW001	8.75	4 to 13	0.5
MW002	8.81	24 to 30	0.5
MW003	8.18	24 to 30	0.5
MW004	8.37	24 to 30	0.5
MW005	8.56	14 to 20	0.5
MW006	8.56	24 to 30	0.5
MW007	8.63	3 to 13	2.0
MW008	8.58	25 to 30	2.0

POINT ID	DEPTH TO WATER (feet- bls)									Average
	SAR 20-May-99	MNA, Y1 Q1 13-Aug-01	MNA, Y1 Q2 6-Dec-01	MNA, Y2 22-Aug-02	MNA, Y3 19-Aug-03	MNA, Y4 4-Aug-04	MNA, Y5 12-Jul-05	MNA, Y6 24-Mar-06	SVE RAP 17-Jan-07	
MW001	7.18	6.54	7.69	6.65	6.93	7.61	6.37	8.41	8.01	7.27
MW002	7.35	6.67	7.77	6.73	7.02	7.71	6.42	8.57	8.09	7.37
MW003	6.72	6.05	7.20	6.07	6.34	6.95	5.81	7.91	7.43	6.72
MW004	6.82	6.07	7.48	6.20	6.50	7.08	5.75	7.96	7.56	6.82
MW005	7.07	6.24	7.51	6.39	6.72	7.36	6.03	8.23	7.75	7.03
MW006	7.08	6.27	7.56	6.45	6.74	7.36	6.05	8.25	7.81	7.06
MW007	-	6.32	7.03	5.99	6.78	7.45	-	7.75	7.35	6.95
MW008	-	6.26	6.98	5.97	6.81	7.50	-	7.76	7.33	6.94
Average	7.04	6.30	7.40	6.31	6.73	7.38	6.07	8.11	7.67	7.02

Point ID	ELEVATION (feet-NAVD-88)									Average
	SAR 20-May-99	MNA, Y1 Q1 13-Aug-01	MNA, Y1 Q2 6-Dec-01	MNA, Y2 22-Aug-02	MNA, Y3 19-Aug-03	MNA, Y4 4-Aug-04	MNA, Y5 12-Jul-05	MNA, Y6 24-Mar-06	SVE RAP 17-Jan-07	
MW001	1.57	2.21	1.06	2.1	1.82	1.14	2.38	0.34	1.48	1.57
MW002	1.46	2.14	1.04	2.08	1.79	1.10	2.39	0.24	1.44	1.52
MW003	1.46	2.13	0.98	2.11	1.84	1.23	2.37	0.27	1.46	1.54
MW004	1.55	2.30	0.89	2.17	1.87	1.29	2.62	0.41	1.55	1.63
MW005	1.49	2.32	1.05	2.17	1.84	1.20	2.53	0.33	1.53	1.61
MW006	1.48	2.29	1	2.11	1.82	1.20	2.51	0.31	1.50	1.58
MW007	-	2.31	1.60	2.64	1.85	1.18	-	0.88	1.68	1.73
MW008	-	2.32	1.60	2.61	1.77	1.08	-	0.82	1.64	1.69
Average	1.50	2.25	1.15	2.25	1.83	1.18	2.47	0.45	1.53	1.61

Notes: "-" indicates not measured or calculated

Yellow indicates recent results

TABLE 2
HISTORICAL ANALYTICAL SOIL BORING RESULTS

SAMPLE LOCATION			SB001	SB002	SB003	SB004
SAMPLE DATE			5-May-99			
SAMPLE DEPTH (FT BLS)		SCTL	2	2	2	2
Tetrachloroethene	µg/Kg	30	BDL	BDL	3.13	2.15
Trichloroethene	µg/Kg	30	BDL	BDL	BDL	BDL
Toluene	µg/Kg	500	BDL	BDL	1.01	1.72
Ethylbenzene	µg/Kg	600	10.6	BDL	1.21	1.40
Xylenes, total	µg/Kg	200	52	BDL	6.02	6.58
All other Volatile Organics	µg/Kg	varies	BDL	BDL	BDL	BDL

SAMPLE LOCATION			SB005			SB007			SB008		
SAMPLE DATE			9-Mar-04			9-Mar-04			9-Mar-04		
SAMPLE DEPTH (FT BLS)		SCTL	2	4	6	2	4	6	2	4	6
Tetrachloroethene	µg/Kg	30	16	1U	14	1U	1U	2	4	2U	3
Trichloroethene	µg/Kg	30	1U	1U	1U	1U	1U	2U	1U	2U	1U
Cis-1,2-Dichloroethene	µg/Kg	400	1U	1U	1U	1U	1U	2U	1U	2U	1U
Trans-1,2-Dichloroethene	µg/Kg	700	1U	1U	1U	1U	1U	2U	1U	2U	1U
Vinyl Chloride	µg/Kg	7	1U	1U	1U	1U	1U	2U	1U	2U	1U
All other Volatile Organics	µg/Kg	varies	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL

SAMPLE LOCATION			SB009			SB006			SB010		
SAMPLE DATE			9-Mar-04			15-Mar-04			15-Mar-04		
SAMPLE DEPTH (FT BLS)		SCTL	2	4	6	2	4	6	2	4	6
Tetrachloroethene	µg/Kg	30	9	1	8	7	2	1U	1U	1U	42
Trichloroethene	µg/Kg	30	1U	1U	1U	1U	1U	1U	1U	1U	1U
Cis-1,2-Dichloroethene	µg/Kg	400	1U	1U	1U	1U	1U	1U	1U	1U	1U
Trans-1,2-Dichloroethene	µg/Kg	700	1U	1U	1U	1U	1U	1U	1U	1U	1U
Vinyl Chloride	µg/Kg	7	1U	1U	1U	1U	1U	1U	1U	1U	1U
All other Volatile Organics	µg/Kg	varies	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL

Notes:

"-" indicates not analyzed

Bold indicates above Method Detection Limit

SCTL : Soil cleanup target levels for leachability based on groundwater criteria FAC Chapter 62-777

BDL: Below Detection Limits

µg/Kg: micrograms per Kilogram

TABLE 3
HISTORICAL GROUNDWATER ANALYTICAL AND FIELD SCREENING RESULTS

Point ID (Screened interval (feet-bls))				MW001 (4 to 13 ft.)								
Task				SAR	MNA Y1Q2	MNA Y2	MNA, Y3	MNA, Y4	MNA, Y4 (D)	MNA, Y5	MNA, Y6	SVE RAP
Sample Date				20-May-99	21-Feb-02	22-Aug-02	19-Aug-03	4-Aug-04	4-Aug-04	4-Jul-05	24-Mar-06	17-Jan-07
		GCTL	NADC	Laboratory Parameter								
Tetrachloroethene	µg/L	3	300	1 U	3.8	8.7	13	3.28	2.83	5.89	11.4	6.39
Trichloroethene	µg/L	3	300	1.1	1 U	1.7	1 U	2.52	2.59	2.91	3.26	6.36
trans-1,2-Dichloroethene	µg/L	100	1000	32.4	1 U	1 U	4	2 U	2 U	2 U	1U	1U
cis-1,2-Dichloroethene	µg/L	70	700	24.2	1 U	1 U	1 U	2 U	2 U	2 U	1U	2U
Vinyl chloride	µg/L	1	100	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1U	1U
Total VOHs	µg/L			57.7	3.8	10.4	17	5.8	5.42	8.8	14.66	12.75
		Field Parameter										
Temperature	°C			26.4	-	29.2	27.4	30.01	30.01	29.4	25.95	28.55
pH				6.59	-	6.33	6.95	6.21	6.21	6.20	6.37	6.19
Redox Potential	mV			-174	-	-102	-107	29	29	100	16.8	13.2
Dissolved Oxygen	mg/L			0.15	-	0.34	0.2	0.28	0.28	0.08	0.78	-
Conductivity	µmhos			170	-	425	476	200	200	310	471	266
Turbidity	NTU			8	-	1.27	6.1	6.1	6.1	6	2	3.16
Ferrous Iron	mg/L			1.2	-	-	-	-	-	-	-	-

Point ID (Screened interval (feet-bls))				MW002 (24 to 30 ft.)								
Task				SAR	MNA Y1Q2	MNA Y2	MNA, Y3	MNA, Y4	MNA, Y4 (D)	MNA, Y5	MNA, Y6	SVE RAP
Sample Date				20-May-99	21-Feb-02	22-Aug-02	19-Aug-03	4-Aug-04	4-Aug-04	4-Jul-05	24-Mar-06	17-Jan-07
		GCTL	NADC	Laboratory Parameter								
Tetrachloroethene	µg/L	3	300	1 U	1 U	1 U	1 U	1 U	2 U	2 U	1U	1U
Trichloroethene	µg/L	3	300	11.4	1 U	1 U	1 U	1 U	2 U	2 U	1U	1U
trans-1,2-Dichloroethene	µg/L	100	1000	1 U	1 U	1 U	1 U	1 U	2 U	2 U	1U	1U
cis-1,2-Dichloroethene	µg/L	70	700	3.7	1 U	1 U	1 U	1 U	2 U	2 U	1U	1U
Vinyl chloride	µg/L	1	100	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1U	1U
Total VOHs	µg/L			15.1	1 U	1 U	1 U	1 U	1 U	1 U	1U	1U
		Field Parameter										
Temperature	°C			26.2	28.1	27.4	27.9	27.2	28.64	29	27.16	29.73
pH				6.73	6.69	6.73	6.34	7.01	6.16	5.75	6.5	5.31
Redox Potential	mV			-388	-20	-488	-144	-138	31	-45	-29.6	-70.4
Dissolved Oxygen	mg/L			0.08	0.91	0.64	0.27	0.18	0.36	0.25	0.59	-
Conductivity	µmhos			143	236	122	103	249	113	164	121	60
Turbidity	NTU			218*	20	24	14.5	6.5	84.7	26	7.5	7.3
Ferrous Iron	mg/L			1.4	1.2	-	-	-	-	-	-	-

Notes:

"-" indicates not analyzed

BDL - Below Detection Limits

GCTL : Groundwater cleanup target level

Yellow indicates recent results

NADC : Natural Attenuation Default Concentration

1 U - Detection Limit (1) - Undetected (U)

µg/L - micrograms per liter

UR Brite
Remedial Action Plan

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TABLE 3
HISTORICAL GROUNDWATER ANALYTICAL AND FIELD SCREENING RESULTS

Point ID (Screened interval (feet-bls))				MW003 (24-30)	MW004 (24-30)	MW005 (14-20)	MW006 (24 to 30 ft.)			MW007 (3 to 13 ft.)		
Task				SAR	SAR	SAR	SAR	MNA Y1Q1	MNA Y1Q2	MNA Y1Q1	MNA Y1Q2	MNA Y4
Sample Date				20-May-99	20-May-99	20-May-99	20-May-99	13-Aug-01	6-Dec-01	13-Aug-01	6-Dec-01	4-Aug-04
		GCTL	NADC	Laboratory Parameter								
Tetrachloroethene	µg/L	3	300	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	2 U
Trichloroethene	µg/L	3	300	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	2 U
trans-1,2-Dichloroethene	µg/L	100	1000	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	2 U
cis-1,2-Dichloroethene	µg/L	70	700	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	2 U
Vinyl chloride	µg/L	1	100	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Total VOHs	µg/L			1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
				Field Parameter								
Temperature	°C			25.6	27.1	26.4	25	29.4	29.2	31.8	28.6	32.37
pH				7.19	7.03	6.73	6.83	6.63	6.48	7.09	6.6	6.51
Redox Potential	mV			-356	-4.21	-273	-369	-31	-41	-2	-280	224
Dissolved Oxygen	mg/L			0.1	0.16	0.13	0.14	0.35	0.42	0.91	0.62	0.42
Conductivity	µmhos			0.77	0.08	0.16	-	0.162	0.093	0.432	0.296	238
Turbidity	NTU			232	57	10	61	16	18	12	38	39.9
Ferrous Iron	mg/L			1.6	2	2	1.6	1.4	-	0.1U	-	-

Point ID (Screened interval (feet-bls))				MW008 (24 to 30 ft.)		
Task				MNA Y1Q1	MNA Y1Q2	MNA Y2
Sample Date				13-Aug-01	6-Dec-01	22-Aug-02
		GCTL	NADC	Laboratory Parameter		
Tetrachloroethene	µg/L	3	300	1 U	1 U	1 U
Trichloroethene	µg/L	3	300	1 U	1.15	1 U
trans-1,2-Dichloroethene	µg/L	100	1000	1 U	1 U	1 U
cis-1,2-Dichloroethene	µg/L	70	700	1 U	1 U	1 U
Vinyl chloride	µg/L	1	100	1 U	1 U	1 U
Total VOHs	µg/L			1 U	1.15	1 U
				Field Parameter		
Temperature	°C			29.4	28.8	28.7
pH				6.77	6.66	6.6
Redox Potential	mV			4	-165	-79
Dissolved Oxygen	mg/L			0.45	0.3	0.45
Conductivity	µmhos			0.194	0.13	91.1
Turbidity	NTU			18	14	10.5
Ferrous Iron	mg/L			0.1U	-	

Notes:

"-" indicates not analyzed

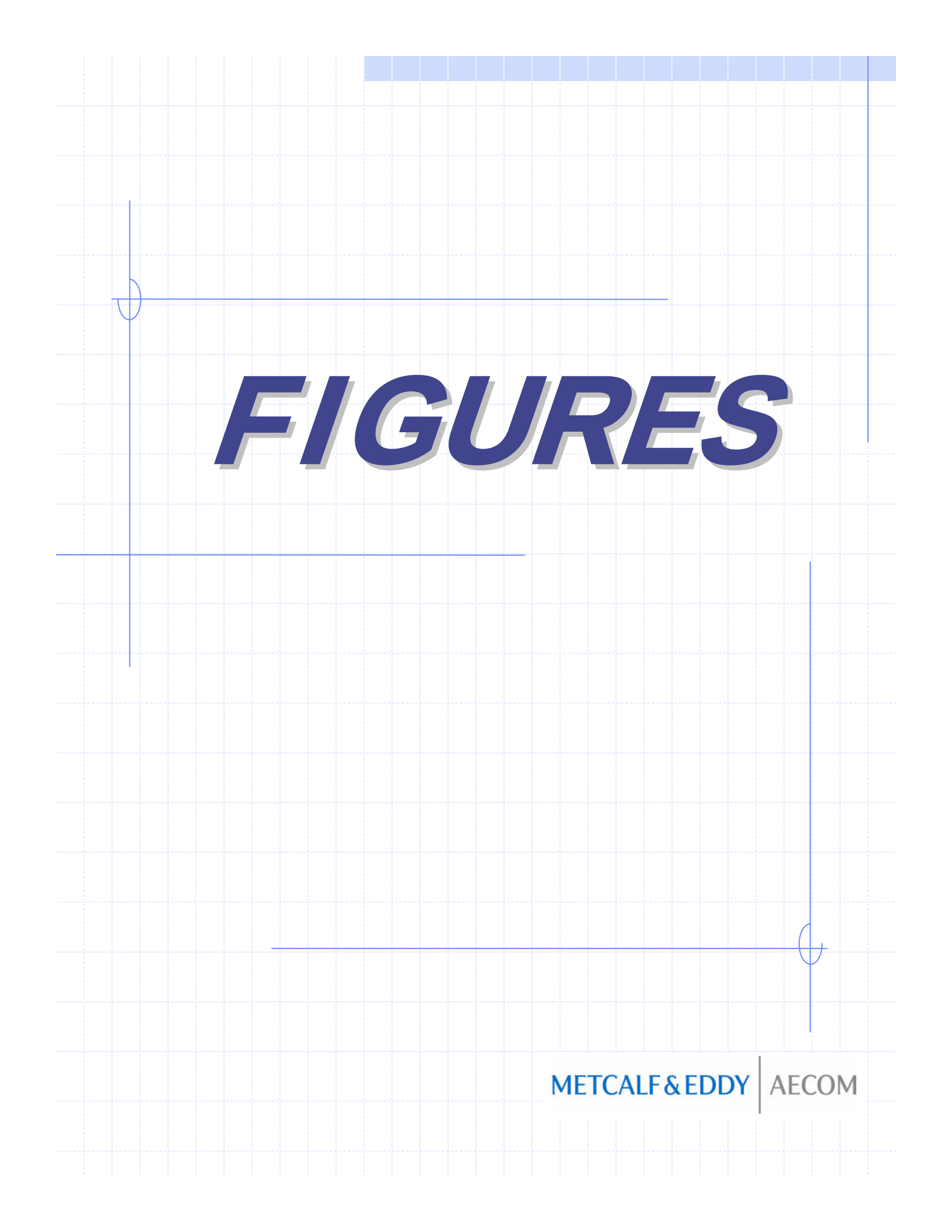
BDL - Below Detection Limits

GCTL : Groundwater cleanup target level NADC : Natural Attenuation Default Concentration

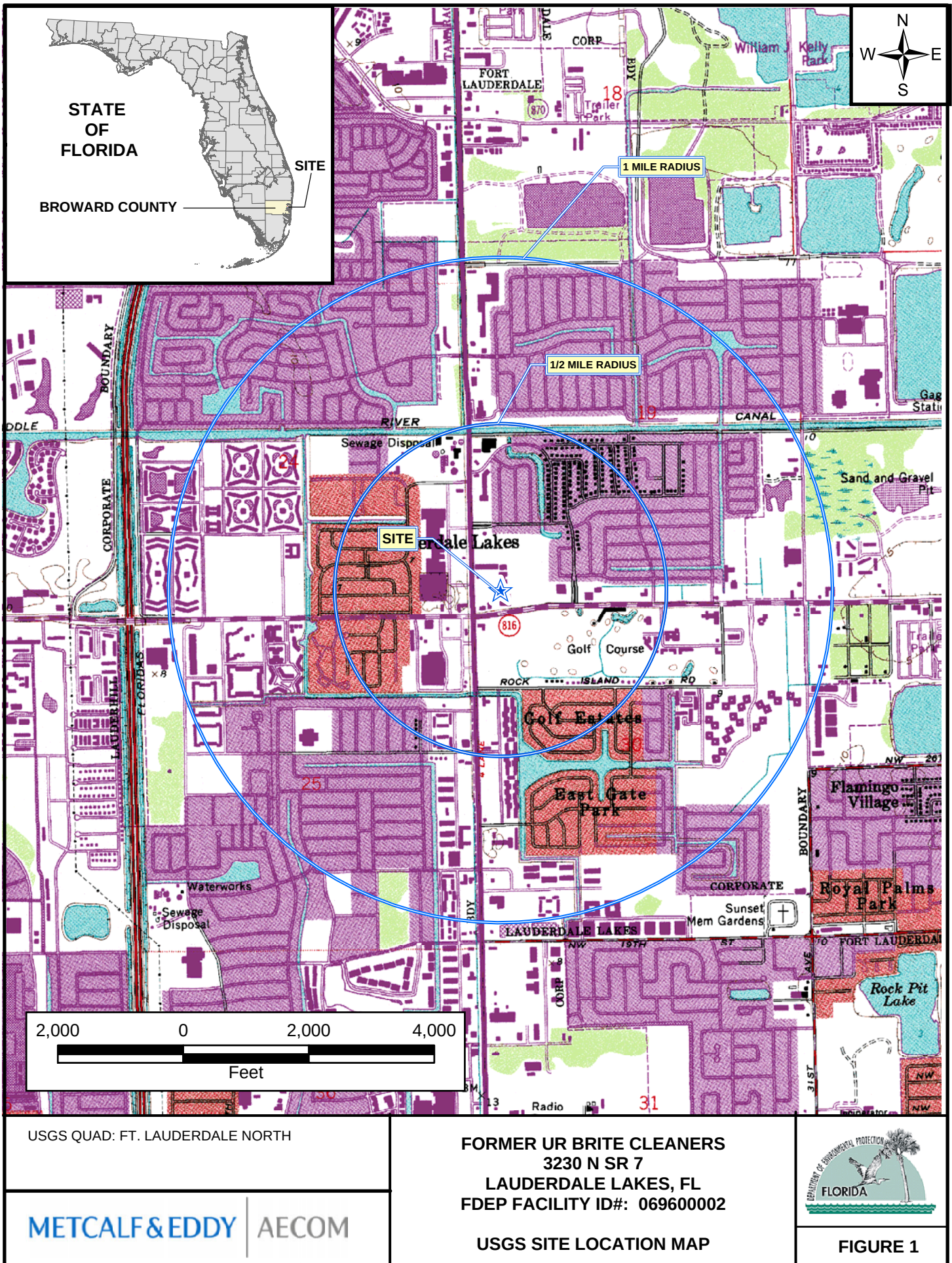
Yellow indicates recent results

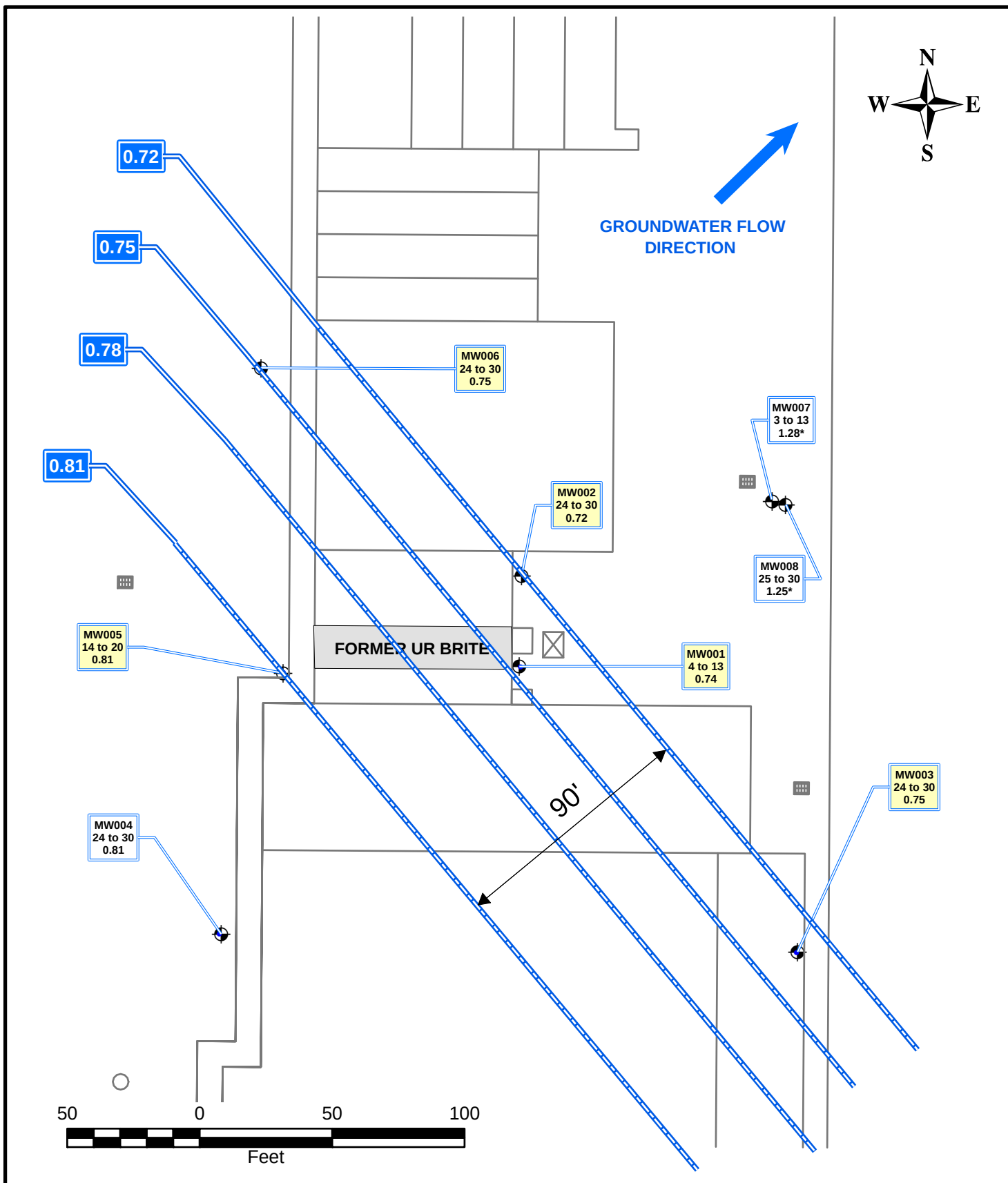
1 U - Detection Limit (1) - Undetected (U)

µg/L - micrograms per liter



FIGURES





Legend



MONITORING WELL

* - indicates anomolus data point

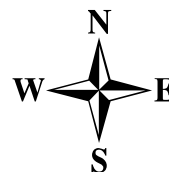
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REMEDIAL ACTION PLAN
FDEP FACILITY ID #09600002

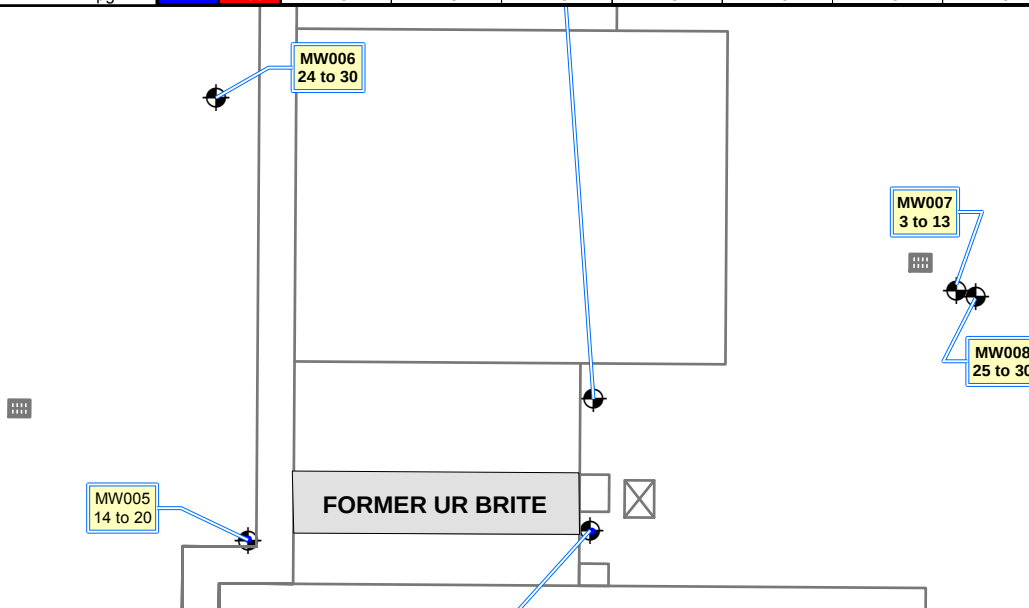
SITE PLAN WITH WATER TABLE ELEVATIONS
(JAN 17, 2007)



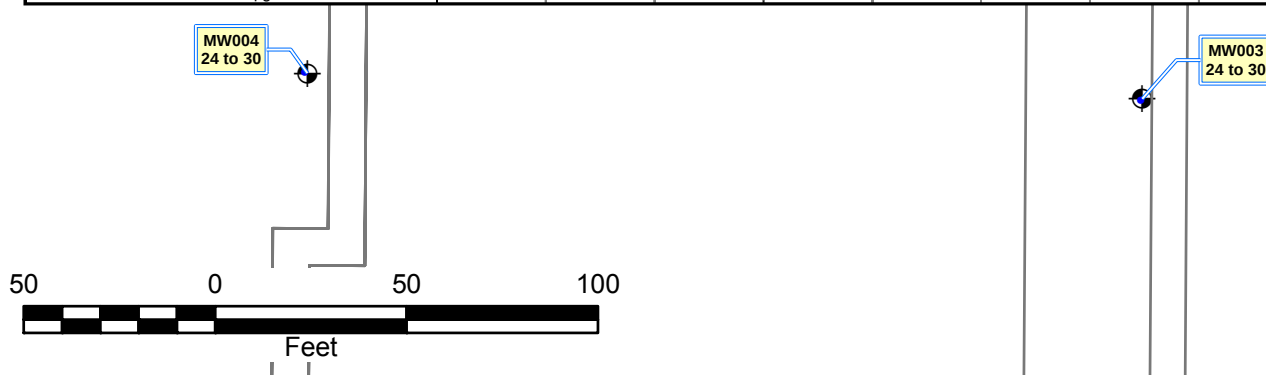
FIGURE 2



Point ID (Screened interval (feet-bls))			MW002 (24 to 30 ft.)									
Task			SAR	MNA Y1Q2	MNA Y2	MNA, Y3	MNA, Y4	MNA, Y4 (D)	MNA, Y5	MNA, Y6	SVE RAP	
Sample Date			20-May-99	21-Feb-02	22-Aug-02	19-Aug-03	4-Aug-04	4-Aug-04	4-Jul-05	24-Mar-06	17-Jan-07	
	GCTL	NADC	Laboratory Parameter									
Tetrachloroethene	µg/L	3	300	1 U	1 U	1 U	1 U	2 U	2 U	1U	1U	
Trichloroethene	µg/L	3	300	11.4	1 U	1 U	1 U	2 U	2 U	1U	1U	
trans-1,2-Dichloroethene	µg/L	100	1000	1 U	1 U	1 U	1 U	2 U	2 U	1U	1U	
cis-1,2-Dichloroethene	µg/L	70	700	3.7	1 U	1 U	1 U	2 U	2 U	1U	1U	
Vinyl chloride	µg/L	1	100	1 U	1 U	1 U	1 U	1 U	1 U	1U	1U	



Point ID (Screened interval (feet-bls))			MW001 (4 to 13 ft.)									
Task			SAR	MNA Y1Q2	MNA Y2	MNA, Y3	MNA, Y4	MNA, Y4 (D)	MNA, Y5	MNA, Y6	SVE RAP	
Sample Date			20-May-99	21-Feb-02	22-Aug-02	19-Aug-03	4-Aug-04	4-Aug-04	4-Jul-05	24-Mar-06	17-Jan-07	
	GCTL	NADC	Laboratory Parameter									
Tetrachloroethene	µg/L	3	300	1 U	3.8	8.7	13	3.28	2.83	5.89	11.4	6.39
Trichloroethene	µg/L	3	300	1.1	1 U	1.7	1 U	2.52	2.59	2.91	3.26	6.36
trans-1,2-Dichloroethene	µg/L	100	1000	32.4	1 U	1 U	4	2 U	2 U	2 U	1U	1U
cis-1,2-Dichloroethene	µg/L	70	700	24.2	1 U	1 U	1 U	2 U	2 U	2 U	1U	2U
Vinyl chloride	µg/L	1	100	1 U	1 U	1 U	1 U	1 U	1 U	1U	1U	1U
Total VOHs	µg/L			57.7	3.8	10.4	17	5.8	5.42	8.8	14.66	12.75



Legend

MONITORING WELL

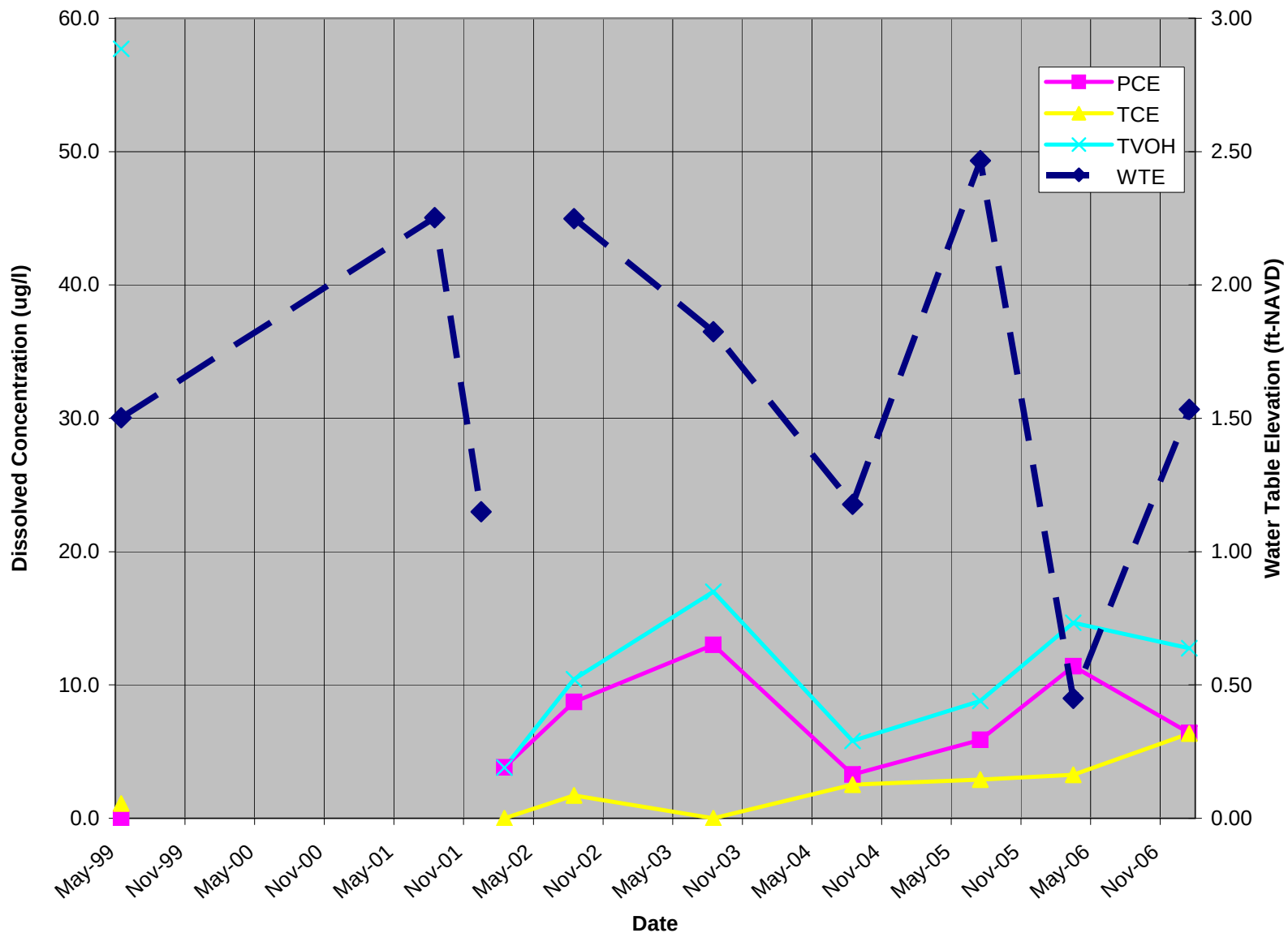
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3230 NORTH STATE ROAD 7, LAUDERDALE LAKES, FL
FDEP FACILITY ID #09600002

GROUNDWATER ANALYTICAL RESULTS
(JANUARY 17, 2007)



FIGURE 3

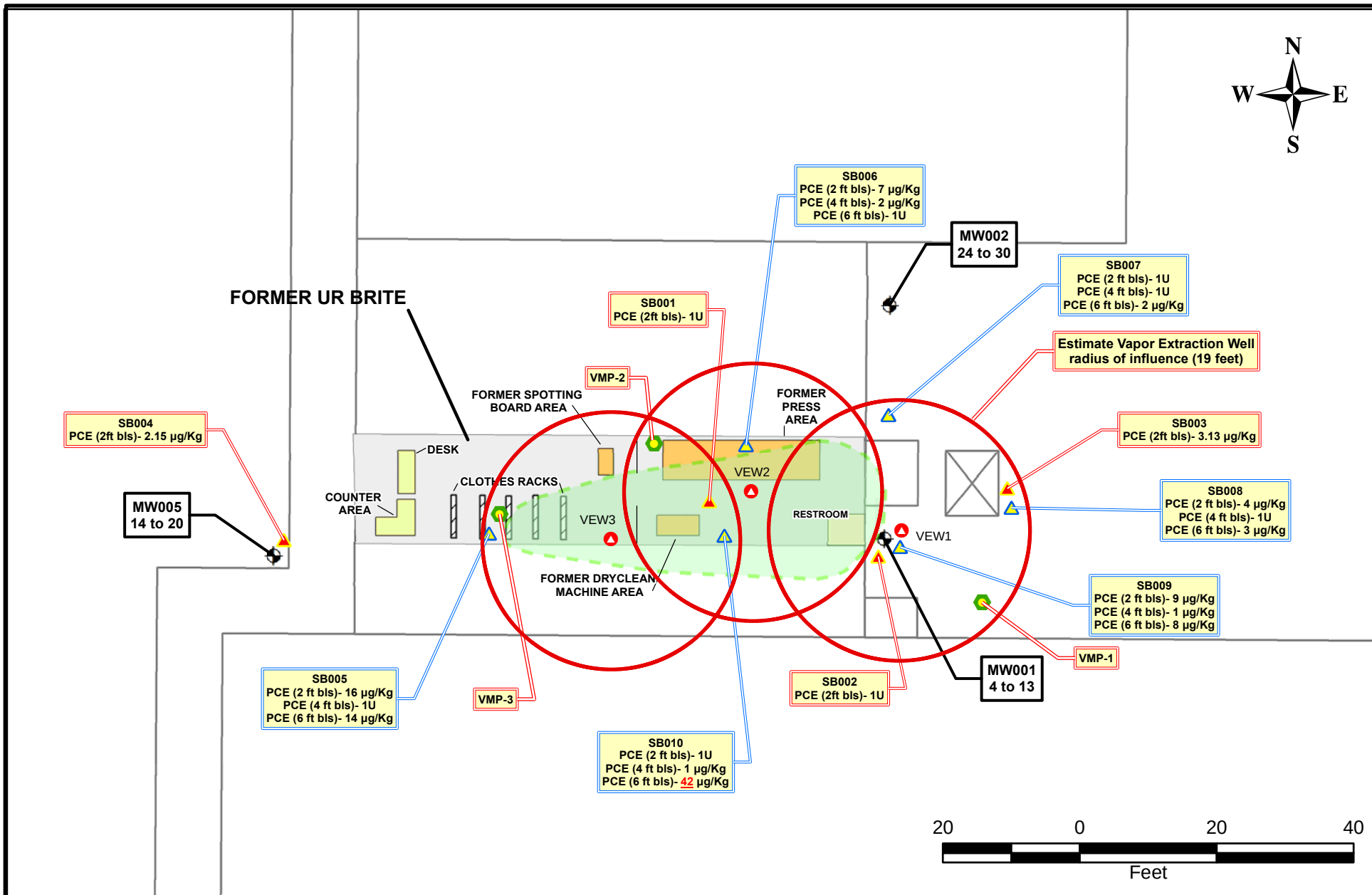


**FORMER UR BRITE CLEANERS
REMEDIAL ACTION PLAN
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**MW001 CONTAMINANT CONCENTRATIONS
VS AVERAGE WATER TABLE ELEVATION**



FIGURE 4



LEGEND:

- ▲ SOIL BORING (SSA 3/04)
- ▲ SOIL BORING (SAR 5/99)
- MONITORING WELL

- PROPOSED VAPOR EXTRACTION WELL
 - PROPOSED VAPOR EXTRACTION WELL
 - ESTIMATE SOIL CONTAMINATION AREA
- 1U - Less than the laboratory MDL
Red, Bold, and Underlined > SCTL for
 Leachability based on Groundwater Criteria

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SOIL VAPOR EXTRACTION SYSTEM LOCATION



FIGURE 5

Appendix A

RAP Summary Sheet & Checklist



Remedial Action Plan Summary

Site Name UR Brite

Location 3230 N. State Road 7, Lauderdale Lakes, FL

Media Contaminated: ☐ Groundwater ☒ Soil ☐ Sediment

DEP Site ID No. 09600002

Current Date 06/01/2007

Date of Last GW Analysis 01/17/2007

Type(s) of Drycleaning Solvent(s) Discharged:

- ☒ Perchloroethylene
☐ Stoddard Solvent
☐ Other types of solvents(FREON 113, etc.)

List: _____

Plume Characteristics:

- Estimated Contaminant Mass (lbs):
Groundwater _____ Soil 0.012
- Area of Plume 1100 (ft²)
- Depth of Plume 7 (ft)

Groundwater Recovery and Specifications:

- No. of Recovery Wells _____
☐ Vertical ☐ Horizontal
- Design Flow Rate/Well _____ (gpm)
- Total Flow Rate _____ (gpm)
- Hydraulic Conductivity _____ (ft/day)
- Recovery Well Screen Interval _____ (ft)
- Depth to Water _____ (ft)

Method of Groundwater Remediation:

- ☐ Pump-and-Treat:
☐ Air Stripper
☐ Low Profile ☐ Packed Tower
☐ Diffused Aerator
☐ Activated Carbon
☐ Primary Treatment ☐ Polishing
- ☐ In Situ Air Sparging - Pressure: _____ (psi)
 - No. of Sparge Points _____
☐ Vertical ☐ Horizontal
 - Design Air Flow Rate/Well _____ (cfm)
 - Total Air Flow Rate _____ (cfm)
- ☐ Biosparging:
 - No. of Sparge Points _____
☐ Vertical ☐ Horizontal
 - Design Air Flow Rate/Well _____ (cfm)
- ☐ Bioremediation:
☐ In Situ ☐ Ex Situ
- ☐ Other _____

Free Product Present: ☐ Yes ☒ No

- Estimated Volume _____ (gal)
- Maximum Thickness _____ (in)
- Method of Recovery (check all that apply):
☐ Manual Bailing ☐ Skimming Pump
☐ Other _____

Method of Groundwater Disposal:

- ☐ Infiltration Gallery ☐ Sanitary Sewer
☐ Surface Discharge/NPDES ☐ Injection Well
☐ Other _____

Method of Soil Remediation:

- ☐ Excavation:
Volume to be excavated _____ (yds³)
☐ Thermal Treatment ☐ Land Farming On Site
☐ Landfill ☐ Bioremediation
☐ Other _____
- ☒ Vapor Extraction System (VES):
 - No. of Venting Wells _____
☐ Vertical ☐ Horizontal
 - VES - Applied Vacuum 25 (wg)
 - Design Air Flow Rate 360 (cfm)
 - Design Radius of Influence 19 (ft)
 - Air Emissions Treatment
☐ Thermal Oxidizer ☐ Catalytic Converter
☐ Carbon ☐ Other _____
- ☐ Soil Bioventing:
 - No. of Venting Wells _____
☐ Vertical ☐ Horizontal
- ☐ In Situ Bioremediation
- ☐ Other _____

Natural Attenuation:

- ☐ Groundwater ☐ Soil
- Method of Evaluation:
☐ Historical Trends
☐ Site-Specific Parameters

Estimated Time of Cleanup: 365 (days)

- Method of Estimation:
☐ Pore Volumes (no. of pore vols. = _____)
☐ Exponential Decay (Decay Rate) _____ (day⁻¹)
☐ Groundwater Transport Model _____
☒ Other _____ Based on experience at similar sites

Remedial Action Plan Checklist

Drycleaning Solvent Cleanup Program

Hazardous Waste Cleanup Section, Florida Department of Environmental Protection

This checklist was prepared as a resource to aid Department staff and Department contractors in the cleanup of contaminated drycleaning sites. This checklist is not intended to serve as a regulatory standard or to supersede any specific regulatory requirements. This checklist should not be applied in blanket fashion. Technical judgment may be necessary in determining the applicability of some items. However, all information listed that is relevant to the remedial design should be provided.

Site Name: UR BriteState Contract Site: ☒Location: 3230 N. State Road 2 Lauderdale Lakes FloridaVoluntary Site: ☐FAC ID No.: 09600002Consultant: Metcalf & Eddy, Inc.

Reviewer: _____ Date: _____

Date of SAR Approval: _____

Page	I. GENERAL	Remarks
Pg. i	(1) Applicable portions of RAP signed, sealed and dated by Florida P.E. or P.G. (Chapters 471 & 492, F.S.)	
Appendix A	(2) RAP summary form included	
Pg. 1	(3) indication whether proposed plan is for voluntary cleanup program or state contracted cleanup	State Cleanup
Pg. 9	(4) summary of ISR activities previously completed	None performed
Pgs. 7, 8	(5) summary of SAR findings and conclusions, and any additional data obtained since that time, pertinent to RAP preparation, including:	
Figure 2, 4 Table 1, 3	a) horizontal and vertical extent of contamination in soil and groundwater (figures showing soil plume above CTLs, groundwater plume above CTLs, groundwater plume above NADSCs, and groundwater DNAPL zone)	Soil only
Appendix C	b) volumes of affected soil and groundwater	Soil only
Appendix C	c) estimated mass of contaminants in soil and groundwater	.012 pounds
N/A	d) presence of NAPLs	None present
Table 1	e) depth to water table	7.02 feet (average)

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Pg. 4	f) stratigraphy, including confining layer location (if present)	
Figure 1, Pgs. 4 - 6	g) groundwater flow direction, gradient and velocity	
Pg. 4, 5	h) hydraulic conductivity of aquifer and method of determination	
Pg. 4, 5	i) transmissivity of aquifer and method of determination	
Pg. 9 Figure 2	(6) current sampling results (within 270 days prior to RAP submittal) used for remediation system design	
N/A	(7) latest date underground storage tanks and pipelines have tested tight, if present at site	None Present
Pgs. 3, 4	(8) potable water considerations	
Pg. 3	a) method of potable water supply to area	
Pg. 3	b) locations of private wells within 1/4-mile, and public wells within 1/2-mile radius of site	
N/A	(9) underground utilities which may enhance contaminant transport shown	Not Considered a conduit
Pg. 10	(10) summary of selected remedial alternative (Decision Memo)	
Pg. 2	a) soil and groundwater CTLs	Soil – Leachability Based on GW (30 µg/kg – PCE)
Pg. 2	b) goals of active remediation	Soil – Leachability Based on GW (30 µg/kg – PCE)
Pg. 2	c) remedial technologies for soil, groundwater plume and groundwater DNAPL	Soil – Soil Vapor Extraction (SVE)
	(11) pre-design activities, including:	
Appendix E	a) project delivery analysis (sealed bid, turnkey, multiple subs, etc.)	Turnkey
Pg. 14	b) surface geophysical survey to locate underground utilities and structures, if appropriate	Utilities Located through Sunshine State Call One Center
N/A	c) surveys completed to identify property boundaries and site features	
Pg. 14	d) coordination with site owner(s) regarding site access needs, remedial system layout, and existing underground utilities and structures	
Pg. 14, 15	e) coordination with local government agencies regarding permitting and building code requirements, and existing underground utilities and structures	

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Pg. 14	f) coordination with utility companies regarding requirements for hook-ups to electrical, water and other systems, and existing underground utilities	
Appendix C	g) property requiring access identified	All components located on target property.
Pg. 15	h) all required local, state and federal permits identified and conditions stated	
Pgs. 14, 15	i) federal, state and local code requirements identified (e.g., UL listed equipment)	
Pgs. 14, 15	j) license requirements identified (electrician, General Contractor, etc.)	M&E's qualifying building contractor to obtain permits.
Appendix C	(12) design and construction details, drawings, and specifications for the remedial alternative selected	
	(13) operational details of the remedial action, including:	
Pg. 16	a) start-up testing	
Pgs. 16, 17	b) site visit frequency, schedule for remediation equipment/system maintenance & monitoring, and special O&M considerations	
Pg. 12	c) disposition of any effluent	Carbon treatment for 30 days followed by atmospheric discharge
Pg. 12	d) expected contaminant concentrations in the effluent	
N/A	e) effluent sampling schedule if treated water is being discharged to soils, groundwater, surface water or POTW	
Pg. 12	f) expected concentrations and quantities (lbs/day) of any contaminants which are reasonably expected to be discharged into the air, sampling schedule, and method of air emissions treatment (if required)	
N/A	g) details of the treatment or disposition of any sludge/solid waste expected to be produced	Excavated soils only
N/A	h) rates and concentrations of any in situ enhancement technologies	
Pgs. 16 - 18	i) tables which summarize the proposed samples and analyses for each pertinent medium, including QA samples	
N/A	j) water table contours to be determined at monthly or quarterly sampling events	
Pgs. 17, 18	(14) proposed methodology including post remedial action soil sampling and groundwater monitoring as applicable for evaluation of the site status after the remedial action is complete to verify accomplishment of the objective of the RAP	

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Pg. 13	(15) feasibility of leasing equipment considered (cost cannot exceed purchase price)	A new trailer will be provided. Leasing is not cost effective.
Pg. 15	(16) nuisance noise and odor to neighbors avoided by careful location of equipment items and exhaust stacks or other mitigating measures	Nuisance noise not expected
Pg. 15	(17) fencing, covering, and/or enclosing treatment area considered	Equipment trailer
Pg. 14	(18) power requirements and electrical system design addressed, including surge protection	230 volt, 3 phase
Pg. 14	(19) telemetry considered	Telemetry not proposed
Pg. 14	(20) locks provided for wells, vaults, treatment compound, electrical panel, etc.	
Appendix F	(21) itemized cost estimate for project: capital, operation, maintenance, sampling and closure	Installation & Startup - \$115,000 Operation & Maintenance - \$32,000
Pgs. 15, 16	(22) statement that signed and sealed as-built (record) documents will be provided, including system startup activities	
	(23) cleanup time	
Pg. 19	a) estimated time of cleanup: groundwater, soil	6 months to 1 year
Pg. 19	b) method used to determine cleanup time	
Pg. 17	c) schedule for procurement, pre-construction activities, construction, and O & M	
	(24) rules and regulations	
Pg. 14	a) Underground work complies with the Florida Trench Safety Act, Sections 553.60 - 553.64, F.S.	
Pg. 14	b) Underground work complies with the Underground Facility Damage Prevention and Safety Act, Sections 556.101 - 556.111, F.S.	
Pg. 14	c) Hazardous materials/waste handling, storage, transporting and disposal performed in accordance with Chapter 62-730, F.A.C. (see 9/29/98 FDEP memo, Bill Linn, "Updated Investigation Derived Wastes (IDW) Best Management Practices")	
N/A	d) Water well design meets requirements of Chapter 62-532, F.A.C.	No water wells installed
N/A	e) Construction, repair and abandonment of water wells performed by contractor licensed in accordance with Chapter 62-531, F.A.C.	No water wells abandoned

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Pg. 15	f) electrical and plumbing work, underground utility construction and excavation, and pollutant storage system installation and removal performed in accordance with Chapters 489 & 553, F.S.	
Pg. 15	g) health and safety procedures meet the requirements of OSHA specified in Title 29, CFR	
Pg. 15	h) warning signs in accordance with Chapter 62-730, F.A.C. (treatment systems)	
Pg. 18	i) sampling and analysis QA/QC in accordance with Chapter 62-160, F.A.C.	
N/A	II. SOIL EXCAVATION AND OFF-SITE LANDFILLING/TREATMENT	
	III. SOIL VACUUM EXTRACTION	
	(1) special considerations	
Pgs. 3, 4	a) relatively permeable soil (rule of thumb: permeability should be greater than 10^{-9} sq cm)	
Table 1	b) depth to groundwater > 3 feet (or dewatering considered)	7.02 feet (average)
Pg. 10	c) relatively volatile contaminants	PCE
N/A	(2) pilot study (generally not required unless suitability of site conditions is marginal or contaminated soils area is relatively large)	No Pilot Test Performed
N/A	a) pilot test components designed and located for cost-effective subsequent integration into full-scale design	
N/A	b) diagram of pilot layout indicating location, diameter and screened interval of vapor extraction well, radial distance of monitoring points from the vapor extraction well, and vapor treatment equipment (if required)	
N/A	c) test duration	
N/A	d) air flow rate (cfm)	
N/A	e) vacuum at extraction well	
N/A	f) vacuum readings at appropriate monitoring wells and/or manometers at various radial distances from extraction well to aid in full-scale design	

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N/A	g) radius of influence (ft); vacuum (inches of water) at limit of radius of influence	
N/A	h) water elevations at monitoring wells to assess groundwater mounding; observed mound (inches)	
N/A	i) measurement of off-gas contaminant concentrations for the purpose of selecting and sizing cost-effective off-gas treatment for full-scale system (typically beginning, middle & end of test)	
N/A	j) determination of soil permeability	
	(3) full-scale design	
N/A	a) flow models and multiphase transport models considered to select appropriate air flow velocity and locate extraction wells, if necessary	
N/A	b) air injection and passive inlet wells considered to enhance air flow rates	Not currently proposed
N/A	c) enhancements such as heated air injection considered to increase contaminant volatility	Not currently proposed
Appendix C	d) evaluation of options for well locations (parking lot, beneath building, etc.), orientation (vertical, horizontal or slanted) and construction (open trenching, directional drilling, etc.)	
Figure 3 Appendix C	e) extraction well location(s) and radius of influence (ft); overlapping radii for adequate coverage of contaminated soils	
Appendix C	f) vapor extraction well(s) construction details:	
Appendix C	1) number of wells; cfm each well; total cfm; well orientation; well diameter; well depth; screen length and slot size; screened interval (ft bls); well sealed with bentonite or non-shrinking grout at screen design depth to prevent short-circuiting; filter pack around screen; bottom plug; casing material (PVC, HDPE, SS, etc.)	
Appendix C	2) screen location close to water table to optimize collection of vapors across vadose depth but not so close as to collect excessive water	
	g) pneumatic design	
Appendix D	1) operating vacuum at well-head(s) (inches water)	
Appendix D	2) calculation of piping system friction losses	
Appendix D	3) calculation of vacuum pump motor hp based on system losses plus required vacuum at well-head	

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Pg. 11	h) vacuum source type: regenerative blower; positive displacement vacuum pump; other:	
Appendix D	1) design cfm at inches of water; operating cfm at inches of water	
Appendix D	2) mfr; model; motor hp; rpm; performance curves	
Appendix D	3) materials of construction and/or assembly to minimize potential for sparking and friction (nonferrous), and corrosion, as appropriate	
Appendix D	4) explosion proof motor and other electrical system components specified as appropriate to meet requirements of Series 500 articles of the National Electrical Code	
Pg. 12	5) protected by thermal overload shut-offs	
Appendix D	i) moisture separator/condensation trap ("knock out pot") and in-line particulate filter prior to inlet of vacuum pump	
Appendix C	j) surface sealing provided for vacuum extraction if necessary, or existing concrete or asphalt adequate	
	k) safety considerations:	
N/A	1) system operation at approximately 25% of Lower Explosive Limit (LEL)	
Appendix C	2) bleed valve provided to control flammable vapor concentrations	
Appendix C	l) instrumentation, gauges and appurtenances:	
Appendix C	1) vacuum gauges at each well and suction side of vacuum pump; temperature gauges at vacuum pump and/or exhaust gas stack	
Appendix C	2) sample ports for influent from each well, at the vacuum pump, and for the off-gas from the treatment unit	
Appendix C	3) air flow control: shutoff/throttling valve at each well; other air flow control device or method	
Appendix C	4) high level switch in knock out pot to either shut down vacuum pump or drain the pot (w/proper treatment or disposal of the contaminated water)	
Appendix C	5) flow meter at wells and vacuum pump (needed to calculate mass emission rate)	
Appendix C	6) vacuum relief valve before vacuum pump	

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Appendix C	7) silencer for vacuum pump/blower	
Pg. 12	m) air emissions (general):	
Pg. 12	1) expected concentrations and quantities of any contaminants discharged to air	
Pg. 12	2) method of cost-effective off-gas treatment to be provided, at a minimum during first 30 days of operation. Provide details in Sections IV & V (for carbon adsorption), or details of any alternative method proposed	
Appendix C	n) manifold piping:	
Pg. 15	1) vacuum or pressure tested	
Pg. 15	2) sloped toward well or liquid traps	
Pg. 15	3) pipe materials (PVC, HDPE, SS, etc.) and diameter	
Pg. 15	4) routing (above or below ground), burial depth and trench details	
Appendix C	o) well-heads: consider below grade vaults and flush-mounted, traffic bearing covers	
Pg. 17	p) system monitoring proposal provided:	
Pg. 17	1) air emissions sampling and analyses (weekly for first month, monthly for next two months, quarterly thereafter)	
N/A	2) provision for monitoring wells to serve as vacuum measurement locations (at various radial distances from extraction wells), or other provisions for verification of proper operation	
	IV. VAPOR-PHASE TREATMENT - GENERAL	
Pg. 12	(1) estimate life-cycle air flow rates, contaminant concentrations & mass emission rates, and other design parameters	
Pg. 12	(2) complies with March 13, 2000 FDEP memo, Brent Hartsfield, "Considerations for Air Emissions from Hazardous Waste Cleanup Sites"	
N/A	(3) cost-effectiveness evaluation of alternative technologies (carbon adsorption, synthetic resin adsorption, catalytic oxidation, condensation, etc.)	

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	V. VAPOR-PHASE CARBON ADSORPTION	
Appendix D	(1) mechanical details, sizing calculations, and operational parameters:	
Appendix D	a) effect of gas temperature on adsorption (heat exchanger considered)	Carbon placed before blower to minimize temperature effects
Appendix D	b) effect of moisture level on adsorption (air/water separator considered)	Moisture Separator placed ahead of carbon to minimize moisture effects
Pg. 12	c) retention (expressed as a percent or pounds of contaminant adsorbed per pound of carbon)	
Pg. 12	d) estimated carbon usage rate	
N/A	e) empty bed contact time (EBCT)	
N/A	f) gas loading rate (cfm/sq. ft.)	
Appendix D	g) configuration of carbon vessels in series and/or parallel	
Appendix D	h) exhaust/diffuser stack	
Appendix D	i) pressure drop	
Pg. 12	j) proper disposal/regeneration and replacement of spent carbon	
Appendix C	k) vessel diameter, height, carbon capacity (lbs), rated air flow rate (cfm), pressure rating, and materials of construction	
Appendix D	l) carbon specifications	
Appendix D	(2) instrumentation, controls, gauges and valves:	
Appendix D	a) high pressure shutdown switch and pressure relief valve	
Appendix D	b) pressure gauges	
Appendix D	c) temperature gauges	
Appendix D	d) sampling ports	
	(3) safety considerations:	
N/A	a) evaluation of need to isolate carbon units from other equipment items in the process train by an in-line flame arrestor	
N/A	b) identification of the Lower Explosive Limit (LEL) for contaminants	

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N/A	c) observance of appropriate requirements in Series 500 articles of the National Electrical Code	
N/A	d) evaluation of fire potential from highly oxidizable contaminants	
N/A	VI. GROUNDWATER EXTRACTION	
N/A	VII. GROUNDWATER TREATMENT SYSTEM-GENERAL	
N/A	VIII. AIR STRIPPING TREATMENT PROCESS	
N/A	IX. LIQUID-PHASE CARBON ADSORPTION	
N/A	X. INFILTRATION GALLERY	
N/A	XI. INJECTION WELL	
N/A	XII. ALTERNATIVE EFFLUENT DISPOSAL METHODS	
N/A	XIII. IN SITU AIR SPARGING OF GROUNDWATER	
N/A	XIV. MULTI-PHASE EXTRACTION	
N/A	XV. IN SITU BIOREMEDIATION	
N/A	XVI. IN SITU CHEMICAL OXIDATION	

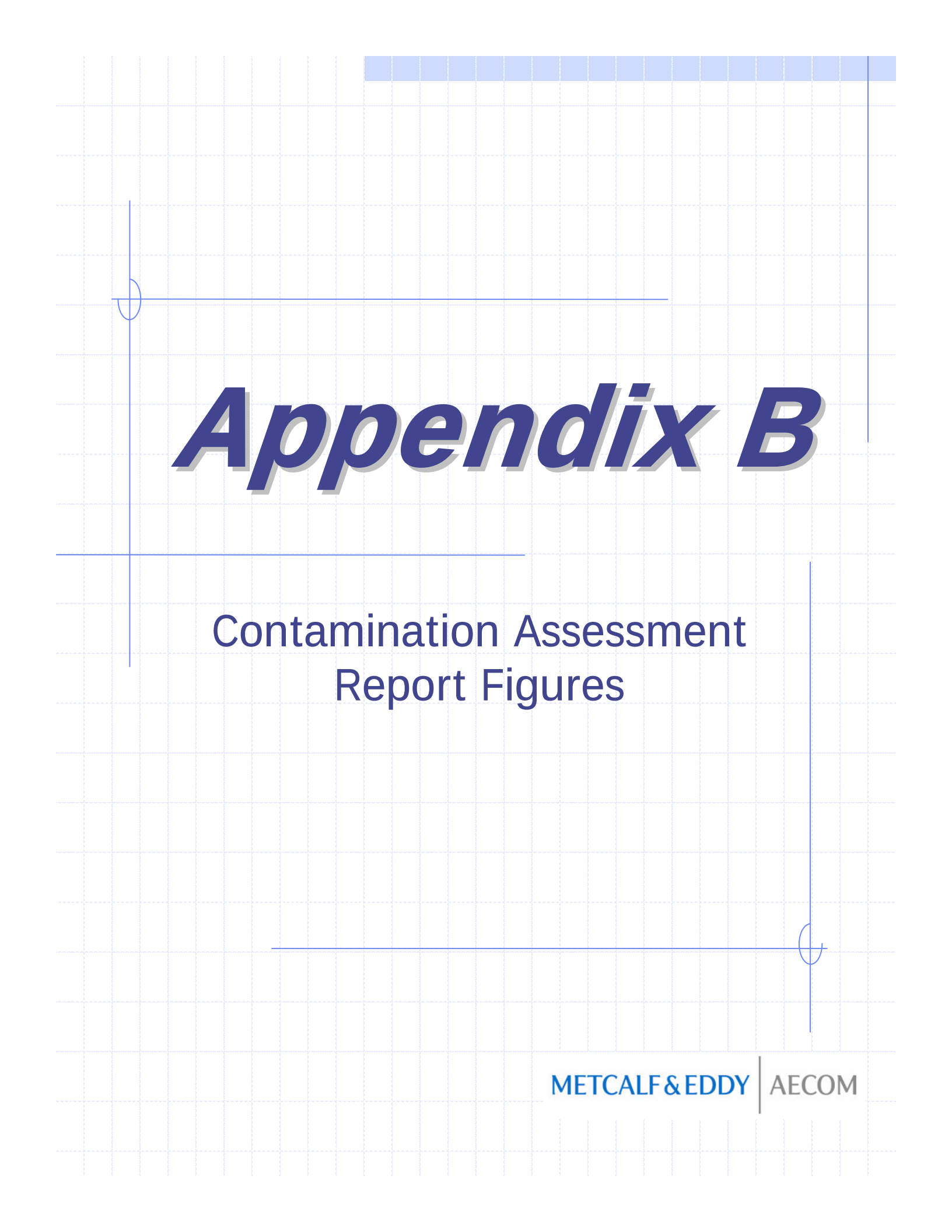
MEMORANDUM

Hazardous Waste Cleanup Section Staff

September 2, 1997

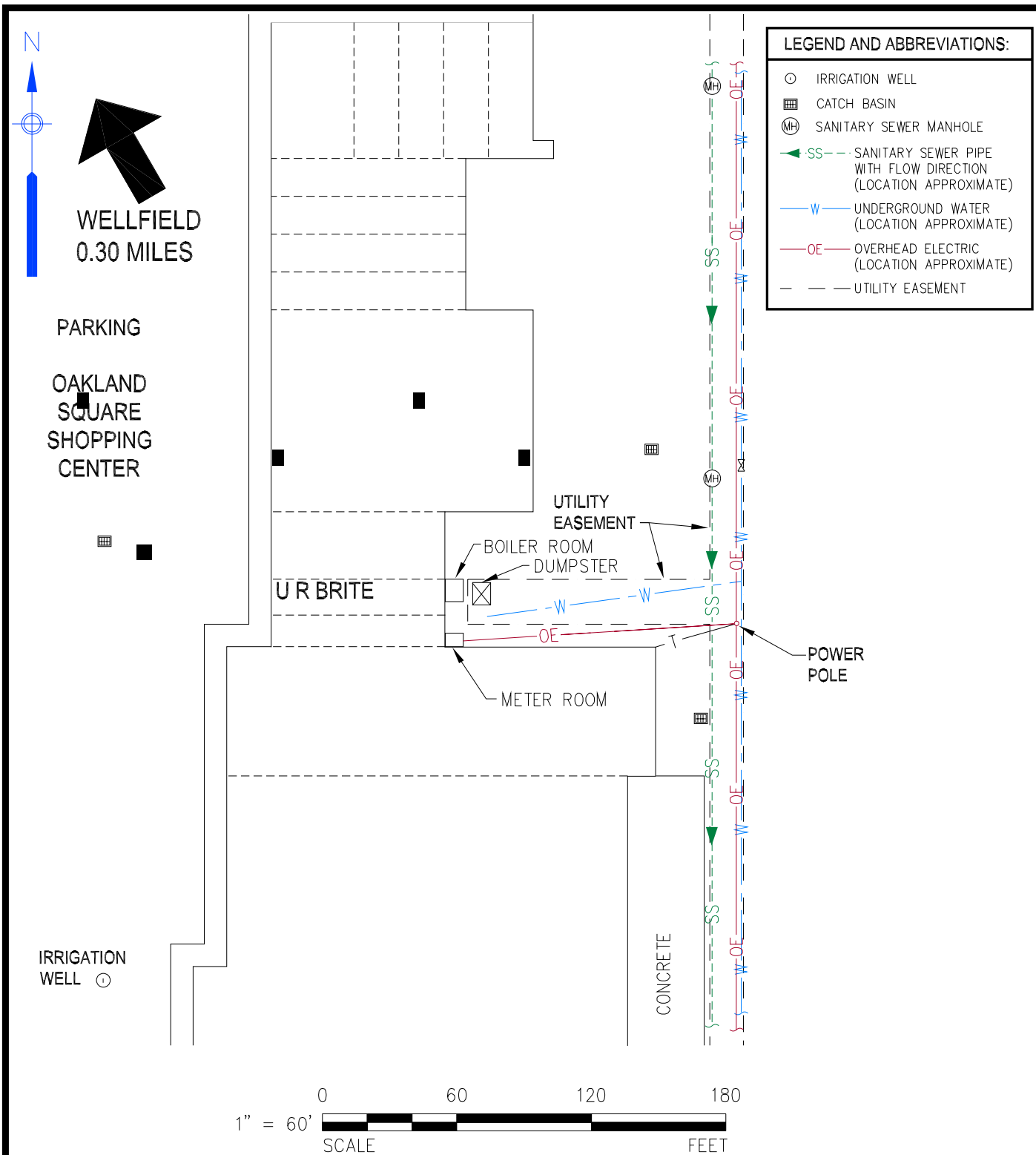
Page 11

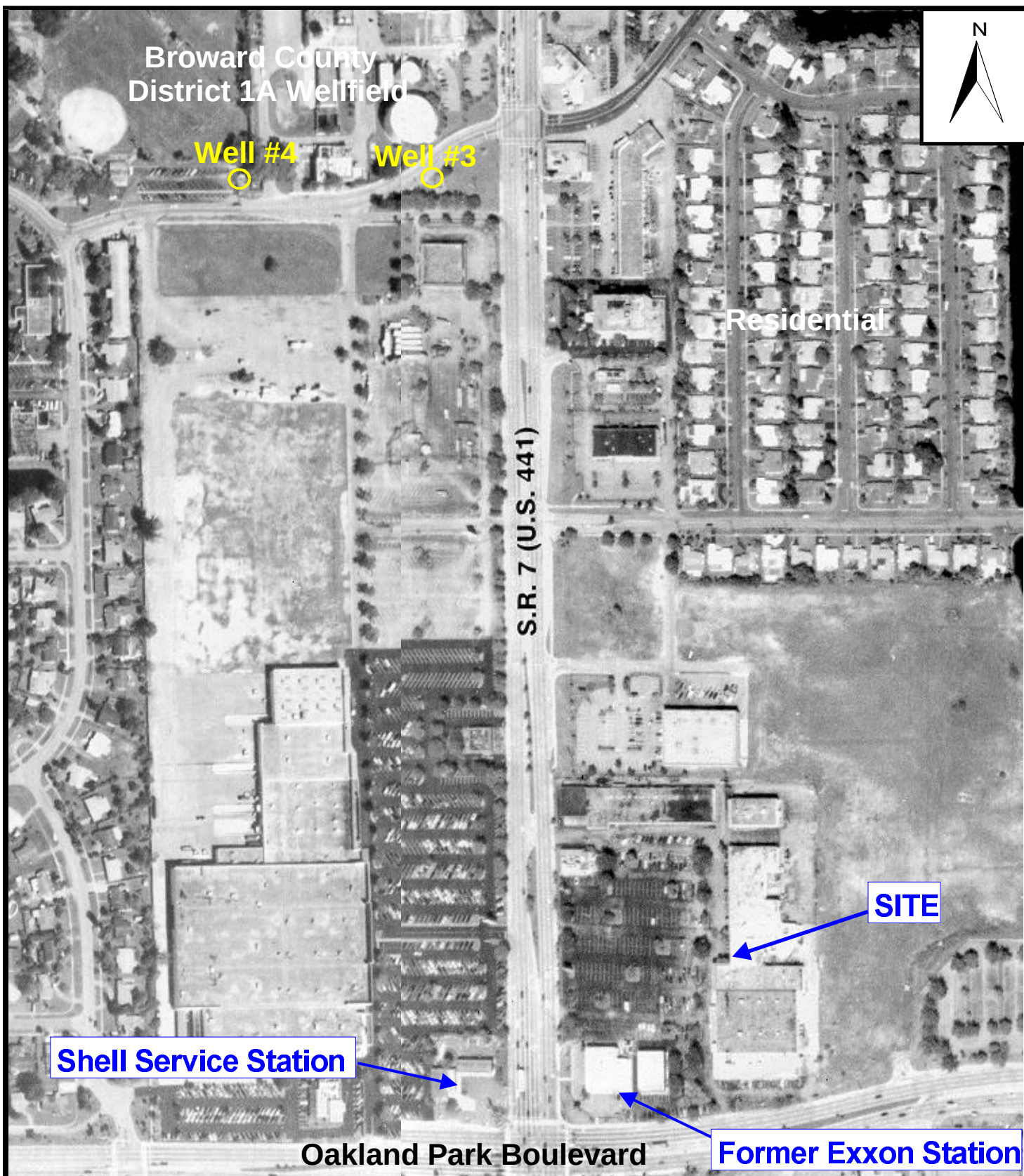
N/A	XVII. IN SITU FLUSHING	
N/A	XVIII. PERMEABLE TREATMENT WALLS (reserved)	
N/A	XIX. RECIRCULATING WELLS (reserved)	
N/A	XX. IN SITU THERMAL PROCESSES (reserved)	



Appendix B

Contamination Assessment Report Figures





Legend:

Scale - 1" = 300'

DATE:

2/25/99

DRAWN BY:

K. Wilson

FILENAME:

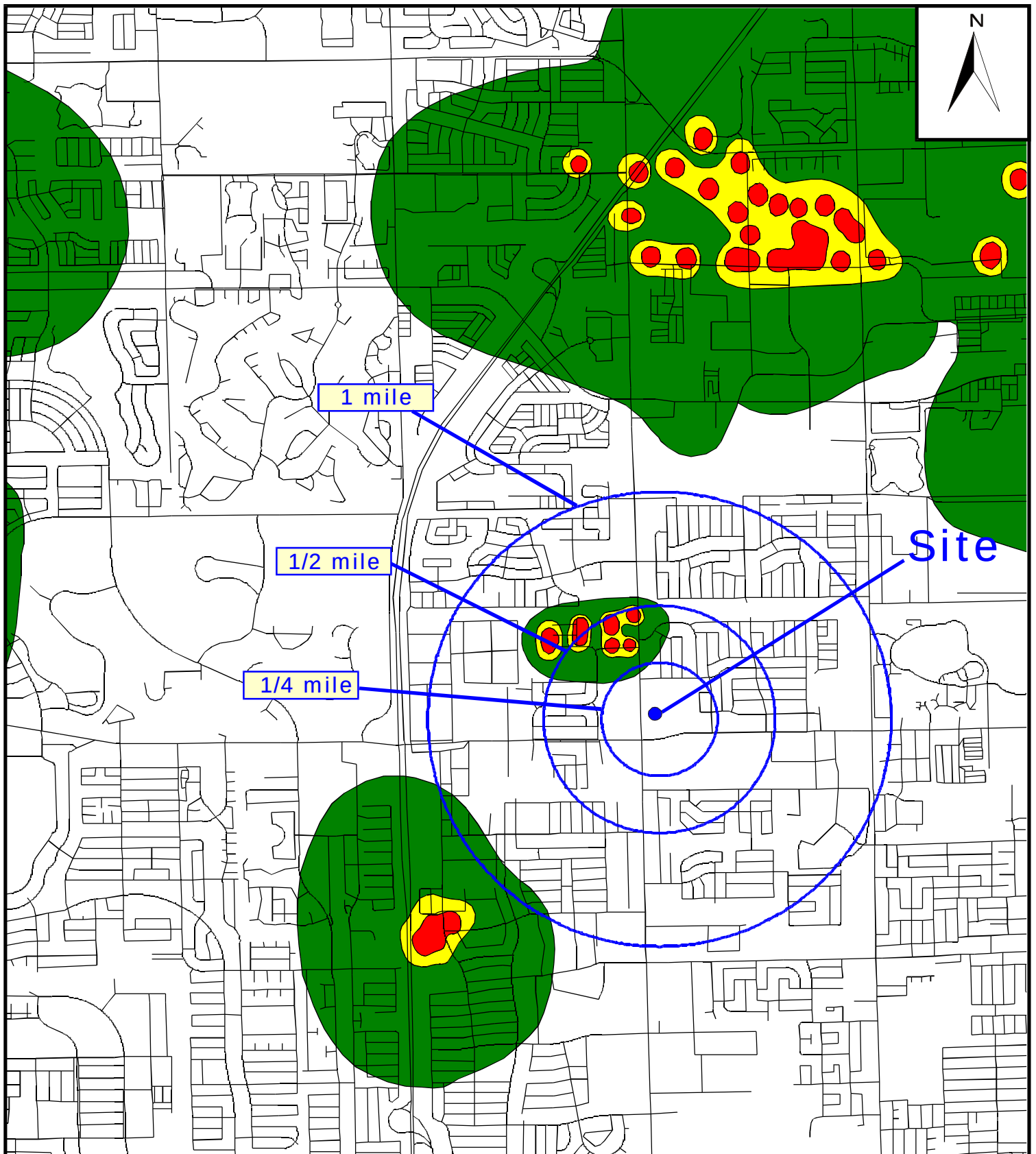
P:\env\dep\public\workplan\lakeland\lakeland.sdr



UR Brite, 3230 North State Road 7, Lauderdale Lakes, FL

Site Vicinity Map

Figure 4



Metcalf & Eddy

3740 Executive Way
Miramar, Florida 33026
Phone (954) 460-7770

Legend: 1" = 36,000"

- ZONE 1: 30 DAY TRAVEL TIME
- ZONE 2: 210 DAY TRAVEL TIME
- ZONE 3: 500 DAY TRAVEL TIME

DATE:

7/28/99

DRAWN BY:

KDW

FILENAME:

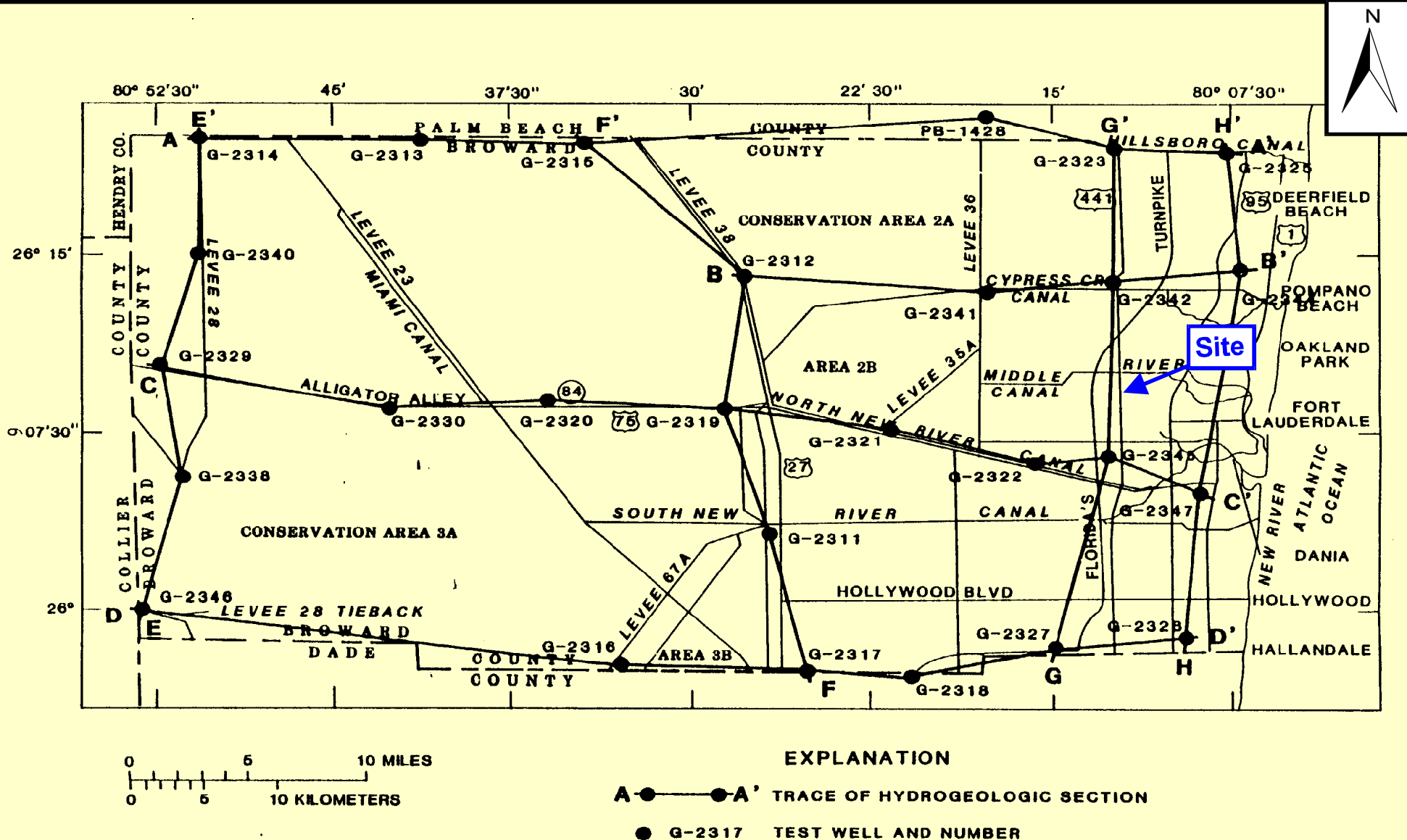
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UR Brite, 3230 North State Road, Lauderdale Lakes, Florida

Municipal Well Field Location Map

Figure 5



DATE:	3/4/99
DRAWN BY:	K. Wilson
FILE NAME:	P:\wp\dep\urbrite\workplan\figures\geosec.cdr



UR Brite, 3230 North State Road 7, Lauderdale Lakes, FL

Geologic Cross Section Location Map

FIGURE 6A



North

Site

FLORIDA'S
TURNPIKE

SECTION
B-B'
G-2342
US-441

SECTION
A-A'
G-2323

HILLSBORO CANAL

G'

40'

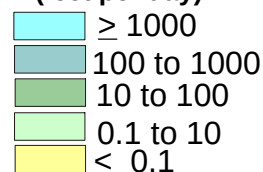
SEA
LEVEL

40'

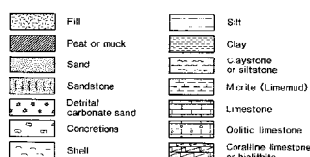
80'

120'

RANGE OF HYDRAULIC
CONDUCTIVITY
(feet per day)



LEGEND:



QUATERNARY—
Qp Pamlico Sand
Qm Miami Colite
Qa Anastasi Formation
Qk Key Largo Limestone
Qf Fort Thompson Formation
Tertiary—
Tl Tamiami Formation
Th Hawthorn Formation
Tm Tamiami Formation and Hawthorn Formation undifferentiated

DATE:

02/22/99

DRAWN BY:

K. Wilson

FILENAME:

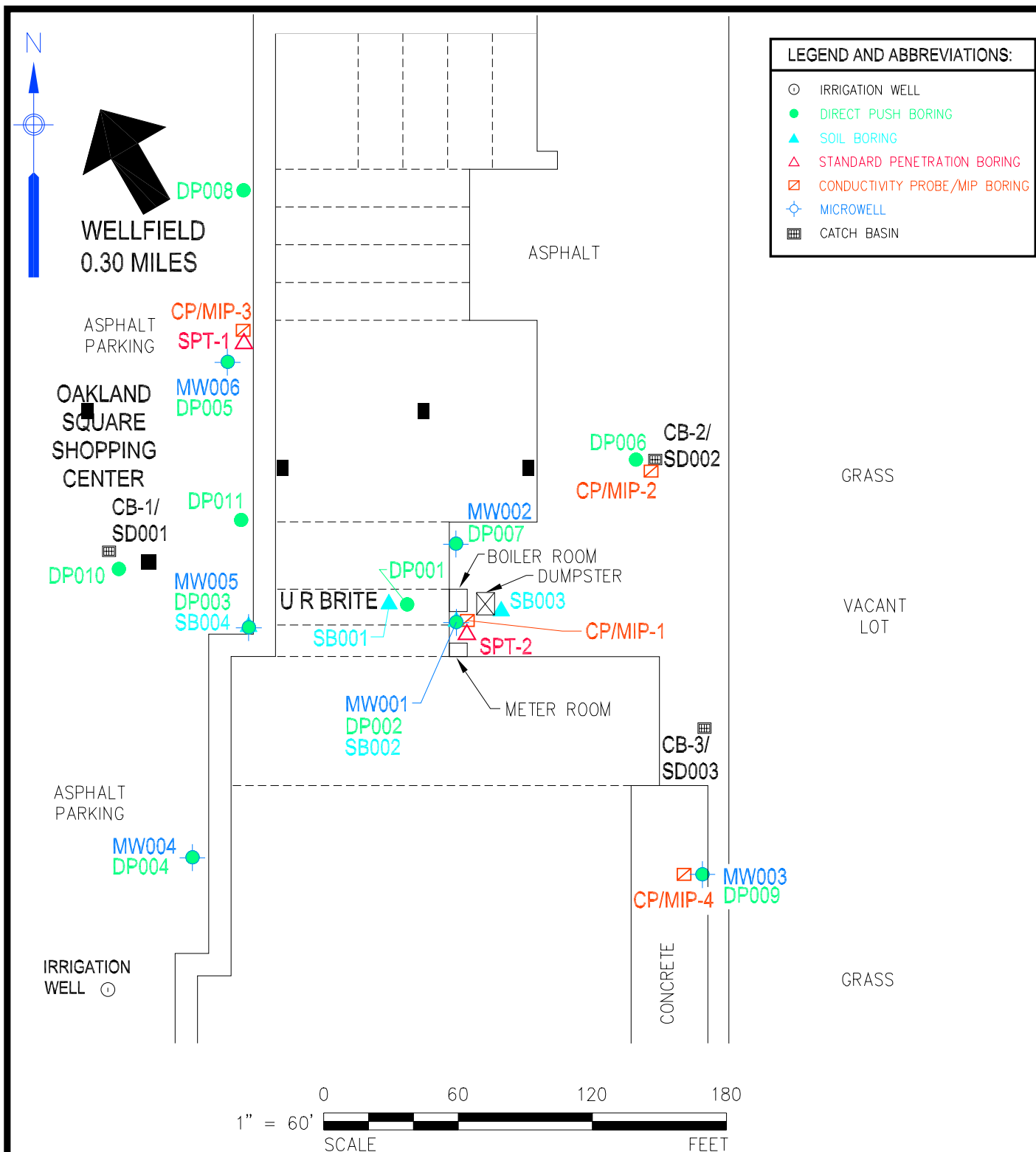
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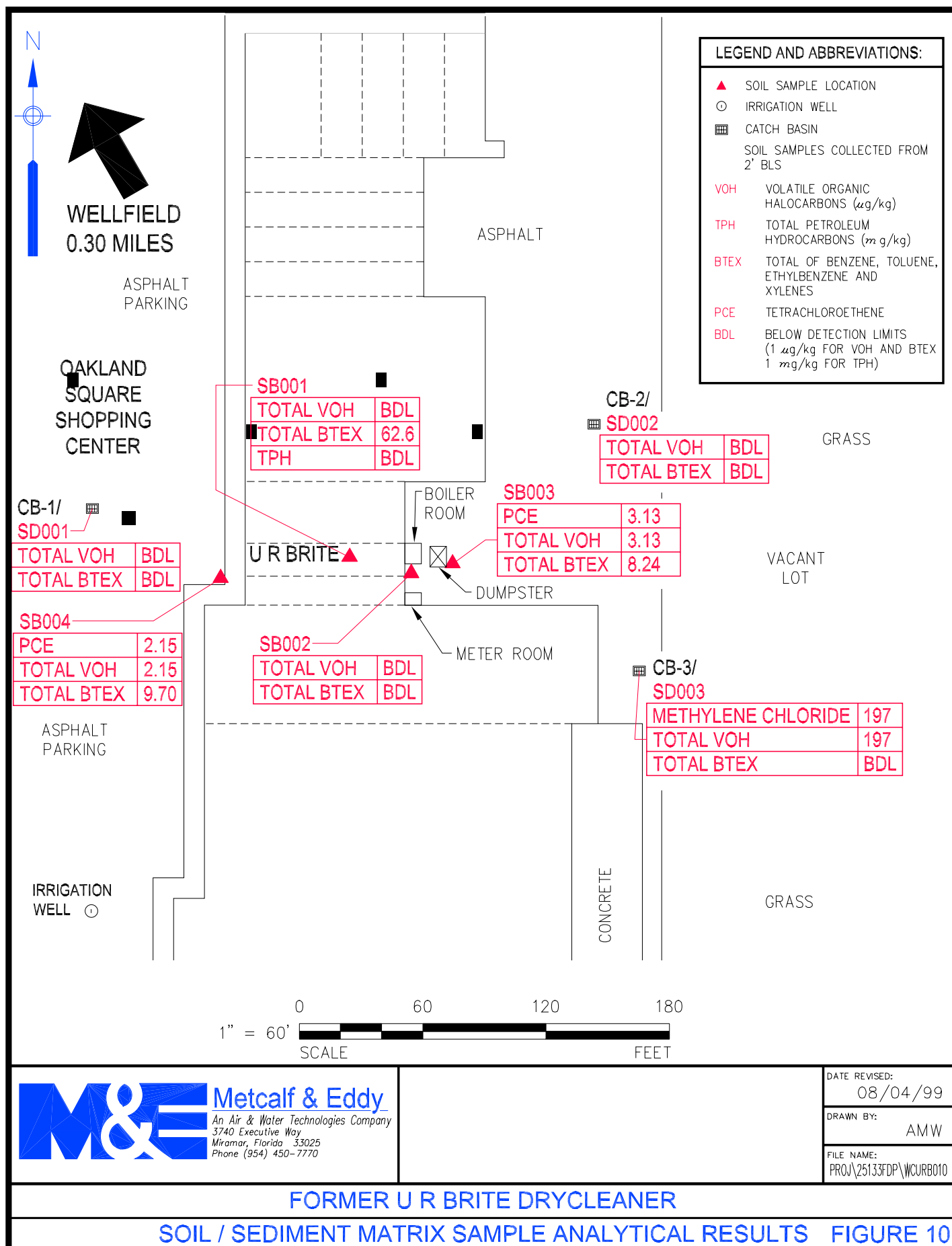


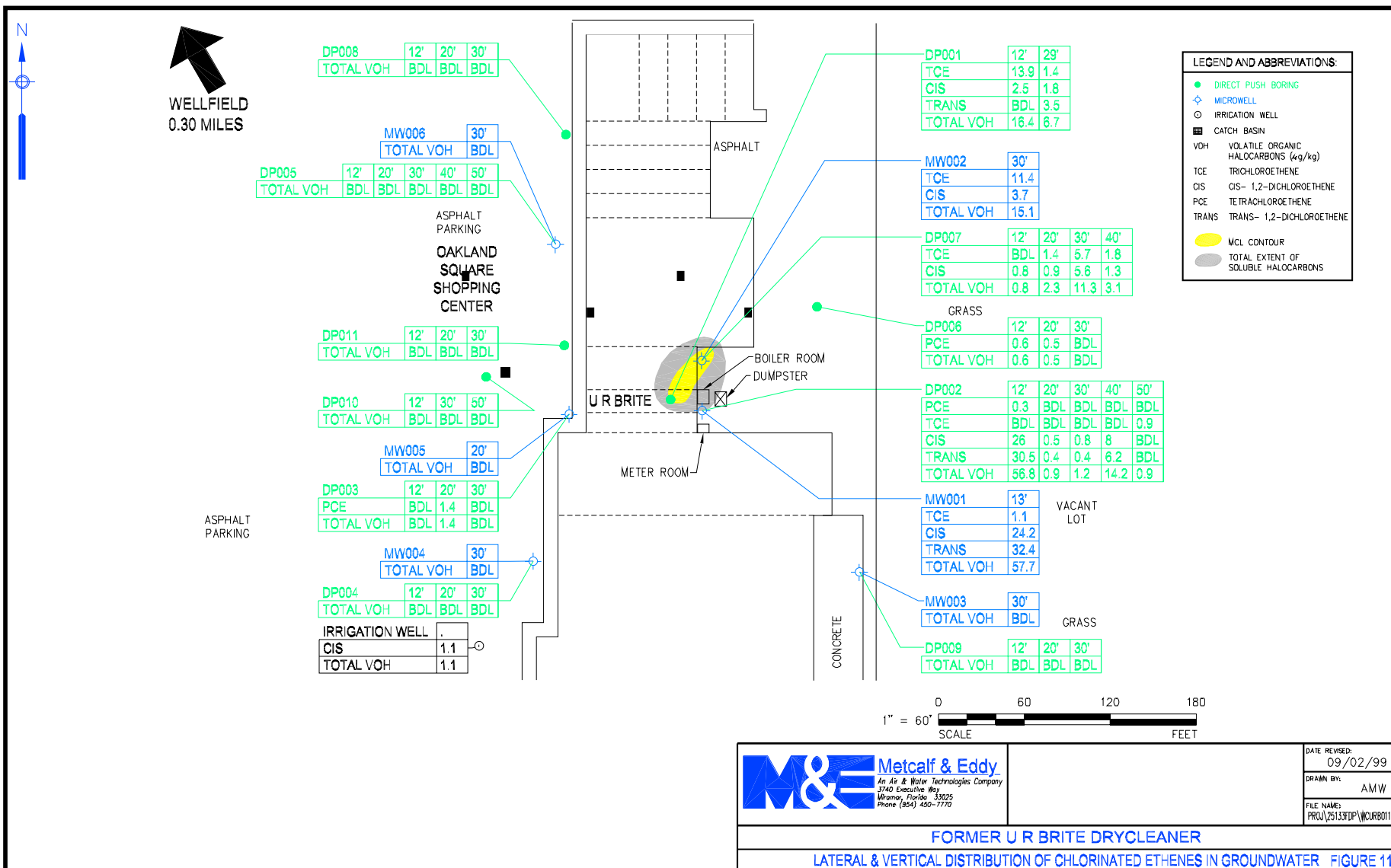
UR Brite, 3230 North State Road 7, Lauderdale Lakes, FL

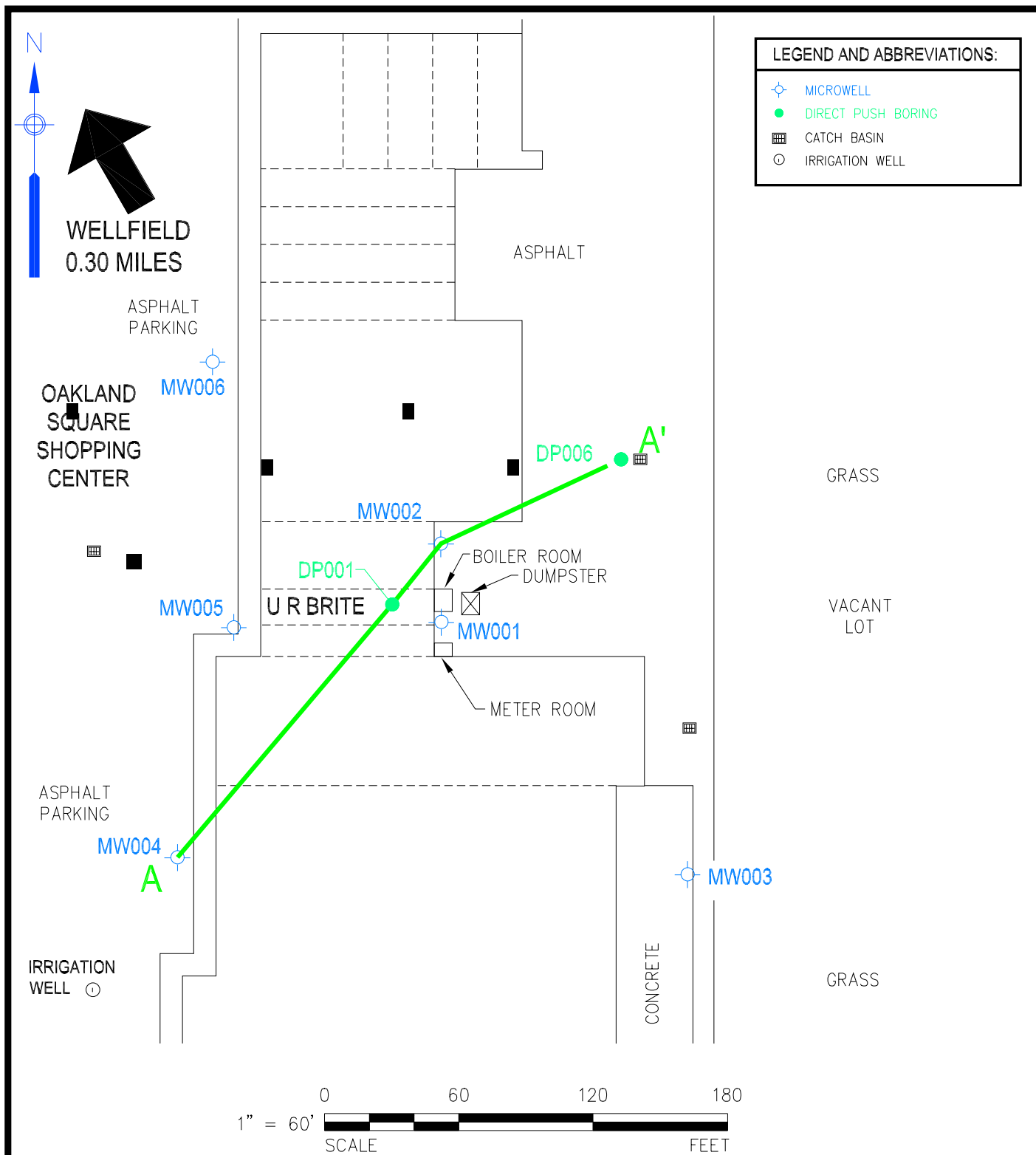
Geologic Cross Section (G-G')

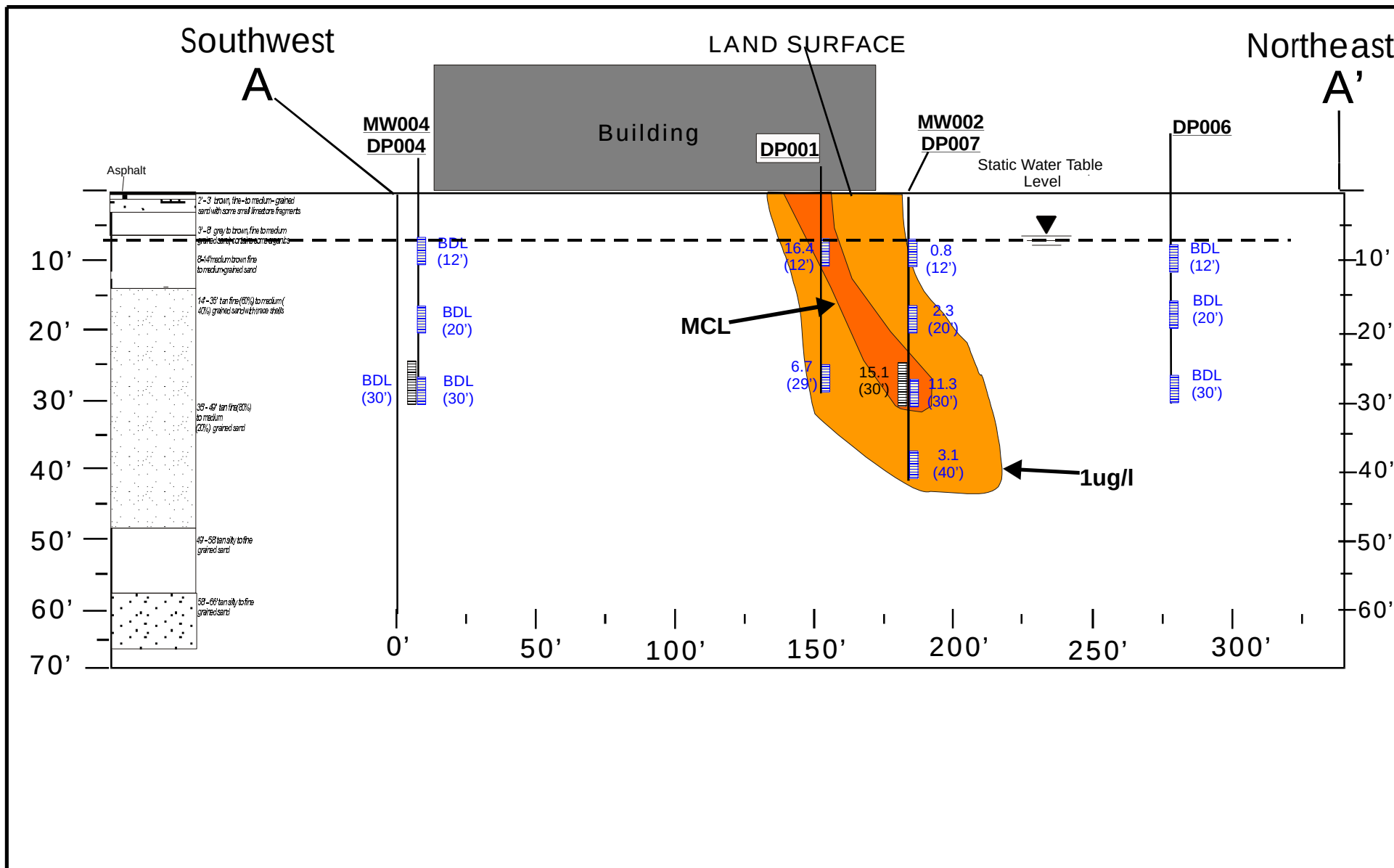
FIGURE 6B





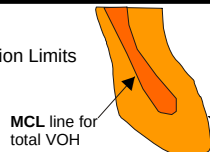






LEGEND:

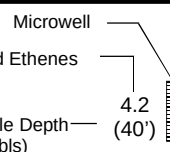
BDL = Below Detection Limits



Total Chlorinated Ethenes (ug/l)

4.2 (40')

Sample Depth (bls)



Direct Push Sample Interval

Total Chlorinated Ethenes (ug/l)

6 (40')

Sample Depth (bls)

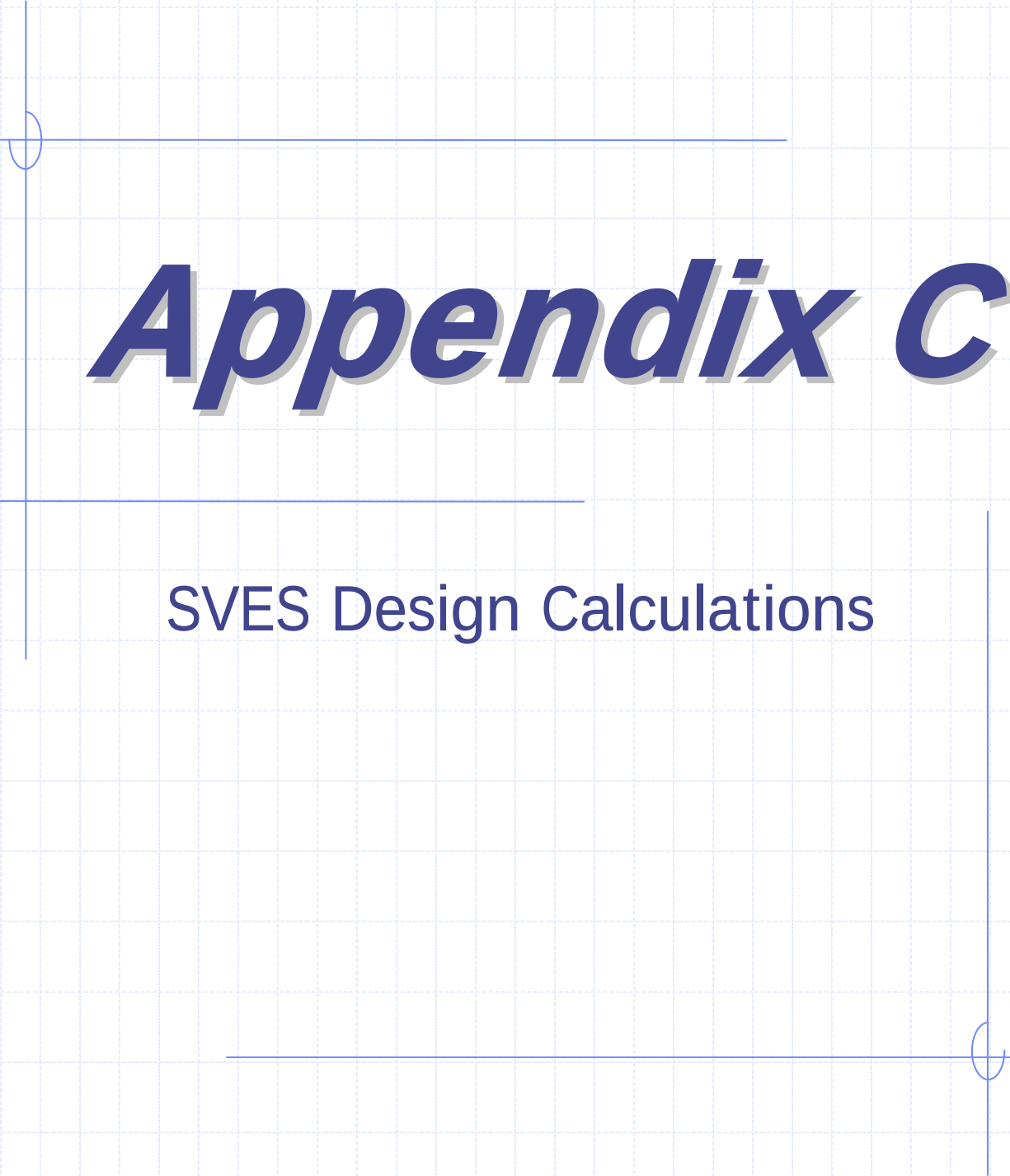
Total Chlorinated Ethenes
The Sum Of :
Tetrachloroethene
Trichloroethene
cis-1,2-Dichloroethene
trans-1,2-Dichloroethene
Vinyl Chloride

Date Revised:	11/16/98
Drawn By:	JJP
File Name:	p:\wplf\depl\toplocarfig\fig13b

UR Bright, 3230 North State Road 7, Lauderdale Lakes, Florida

North - South (A-A') Cross Section With Vertical Distribution of Total Chlorinated Ethenes in Groundwater

Figure 13B



Appendix C

SVES Design Calculations

Appendix C Soil Contaminant Mass Calculations

PCE Volume Calculation			
Variable	Value	units	Parameter
Area of Plume =	1100	ft ²	Obtained from Soil Area in Figure 4 Approx 20' by 55'
Depth of Contamination =	6	ft	Depth interval of 1 to 7 feet bls
PCE Volume =	6,600	ft³	
Analytical Soil Boring Data			
PCE Location	Depths (ft bls)	PCE Concentration (ug/kg)	
SB005	6	14	
SB006	2	7	
SB009	2	9	
SB010	6	42	
Total PCE Concentration =		72	
Average PCE Concentration =		18.0	
PCE Mass Calculation			
Variable	Value	units	Parameter
ρ	100	lb/ft ³	Soil Specific Mass
V_{PCE}	6600	ft ³	PCE Plume Volume
C_{PCE}	18.0	ug/kg	Average PCE Concentration
1 ug =	1.00E-06	g	Conversion Factor
1 lb =	454	g	Conversion Factor
1 lb =	0.454	kg	Conversion Factor
Mass Equation			
PCE Mass Equation= $V_{PCE} * \rho * C_{PCE} * 0.454 / (1000000 * 454)$			
PCE Mass =	0.012	lbs	

Appendix C Johnsons Equations Calculations

Data from From Elite Cleaners

CALCULATION DATA								
Observed Data 1/19/2006 (Elite Cleaners)			Johnson's Equation (Elite Cleaners)			Median {Elite Cleaners (Observed) / Elite Cleaners (Johnson's Equation)}		
Vacuum at VEW-2 ("wg)	Radius of Influence (ft)	Flow (scfm)	Vacuum ("wg)	Radius of Influence (ft)	Flow (scfm)	Vacuum ("wg)	Radius of Influence (ft)	Flow (scfm)
17.0	16.8	90	17.0	16.8	82	17.0	16.8	86
23.4	19.0	115	23.4	19.0	111	23.4	19.0	113
30.1	20.2	140	30.1	20.2	143	30.1	20.2	141
33.4	21.0	165	33.4	21.0	158	33.4	21.0	161
41.8	22.0	190	41.8	22.0	198	41.8	22.0	194
47.0	22.5	215	47.0	22.5	223	47.0	22.5	219

NOTES: **Bold Blue:** Values obtained using Johnson's Equation **Bold Red:** Values obtained from the median of both the step test and Johnson's equation

Design specifications for UR Brite

Description	Symbol		Units
Height of Screen	H	6	ft
	pi	3.14159	
Soil Permeability	k	4.36745	darcy
Viscosity	u	0.0185	cp
Absolute Pressure	Pw	0.93860	atm
Pressure	P	25.0	"wg
		0.06140	atm
Ambient Pressure	Patm	1	atm
Well Radius	Rw	2	inches
Influence Radius	Ri	228	inches

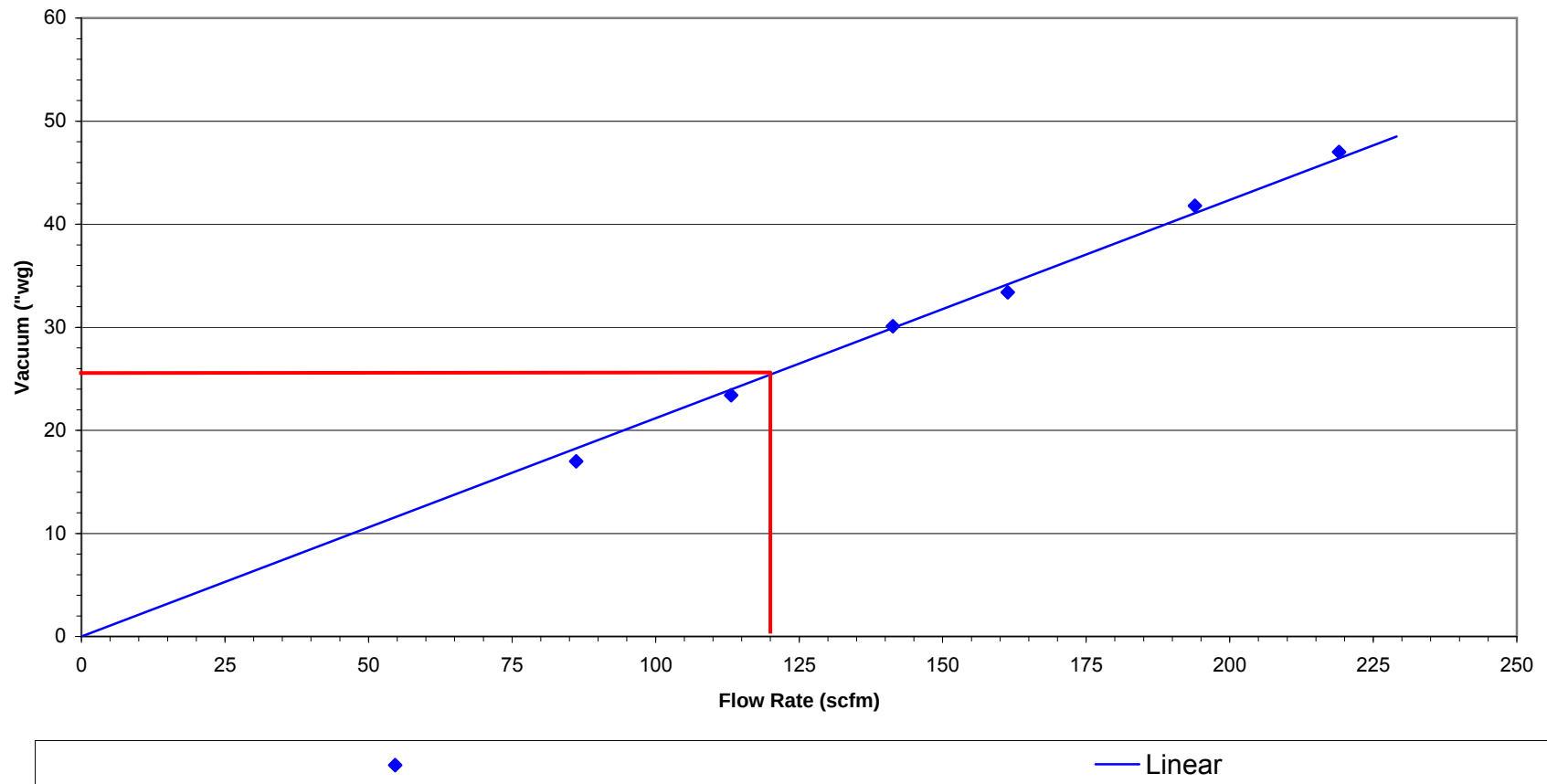
Johnson's Equation	$Q = (H \cdot \pi \cdot (k/u) \cdot P_w) \cdot ((1 - (P_{atm}/P_w)^2) / (\ln(R_w/R_i)))$		
Johnson's Equation	Q =	119	scfm

UR Brite
Remedial Action Plan

METCALF & EDDY | AECOM

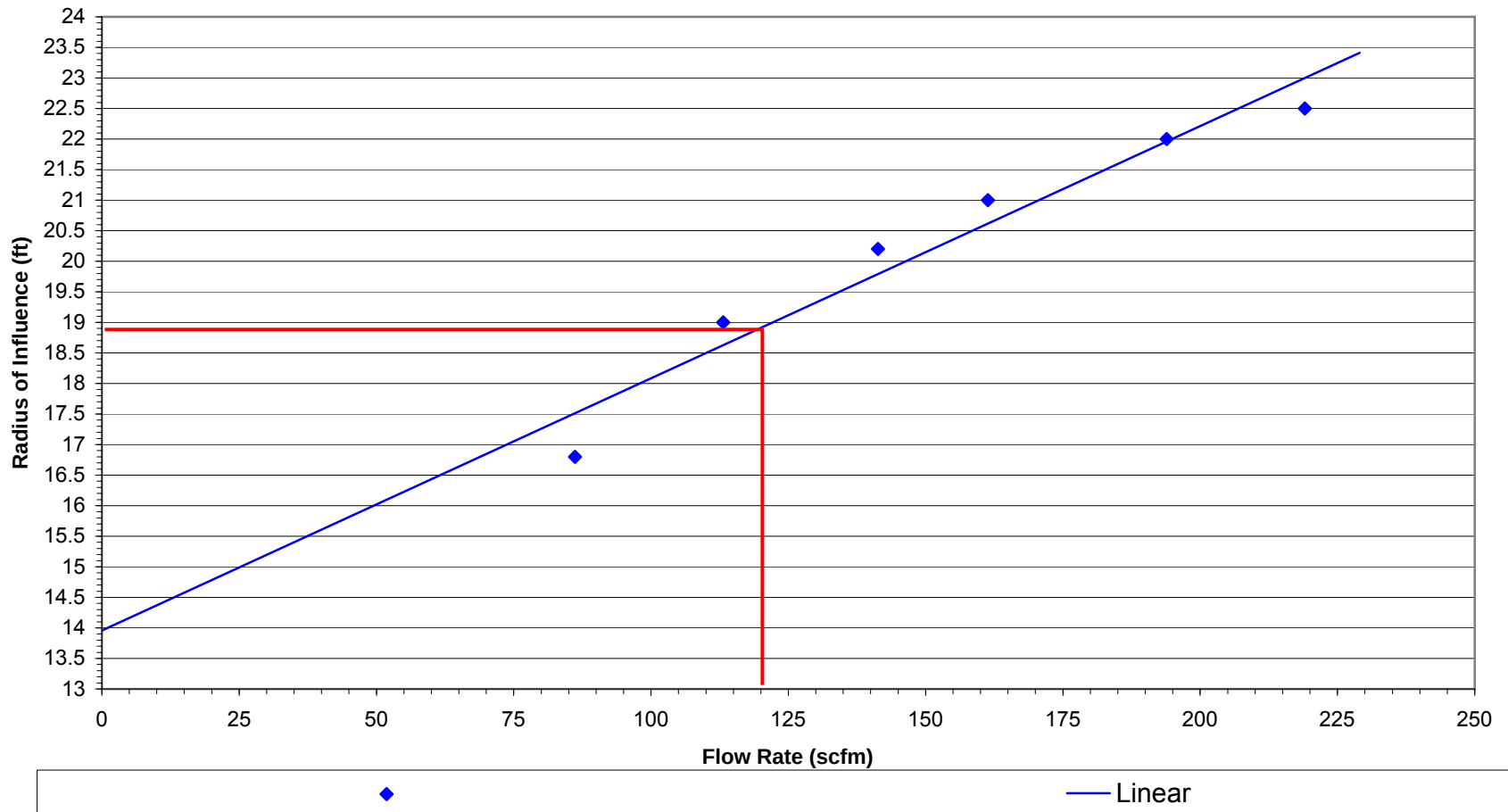
Appendix C
Johnsons Equations Calculations (Median)
Three Vapor Extraction Wells

Vacuum vs Flow Rate



Appendix C
Johnsons Equations Calculations (Median)

Radius of Influence vs Flow Rate



Appendix C Former Elite Cleaners Step Test

Date: 19-Jan-06
Start Time: 10:15 AM

Finish Time: 12:30 PM
Weather: Cloudy Conditions and 71°F
Water Level at VEW-2: 8.55 ft

Well Location	Distance from VEW-2 (ft)
VEW-2	0.16
VMP-1	29
VMP-2	9.5
VMP-3	10
VMP-4	14
VMP-5	35.5

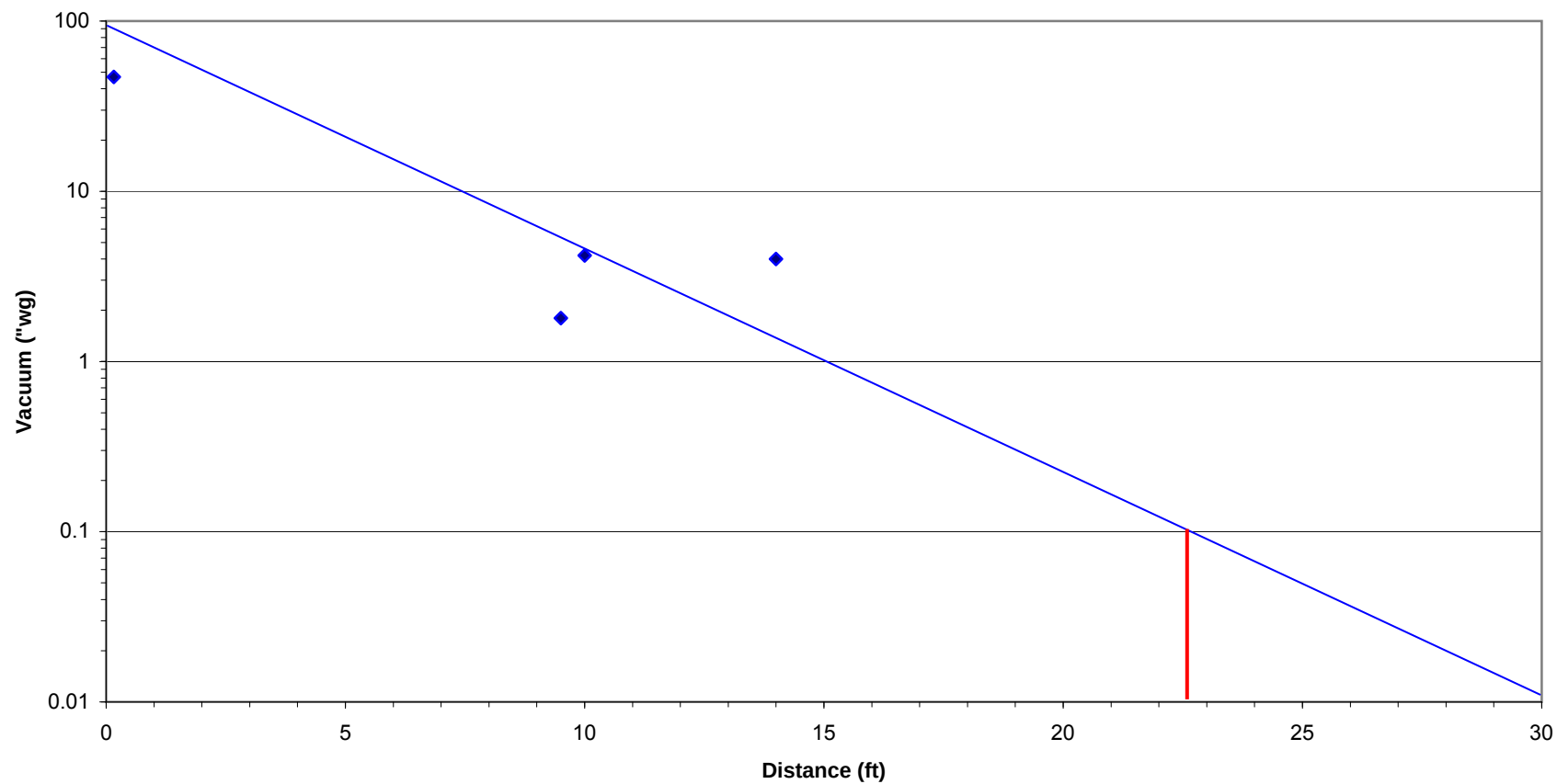
Step Number:	# 1	# 2	# 3	# 4	# 5	# 6
Flow Rate (scfm)	215	190	165	140	115	90
Well ID	Vacuum ("wg)					
VEW-2	47	41.8	33.4	30.1	23.4	17
VMP-1	0	0	0	0	0	0
VMP-2	1.8	1.5	1.2	1	0.7	0.4
VMP-3	4.2	3.5	2.9	2.5	1.9	1.3
VMP-4	4	3.4	2.8	2.4	1.8	1.2
VMP-5	0	0	0	0	0	0

Appendix C

Former Elite Cleaners Step Test - January 19, 2006

Step Test # 1

VEW-2 Flow Rate = 215 scfm

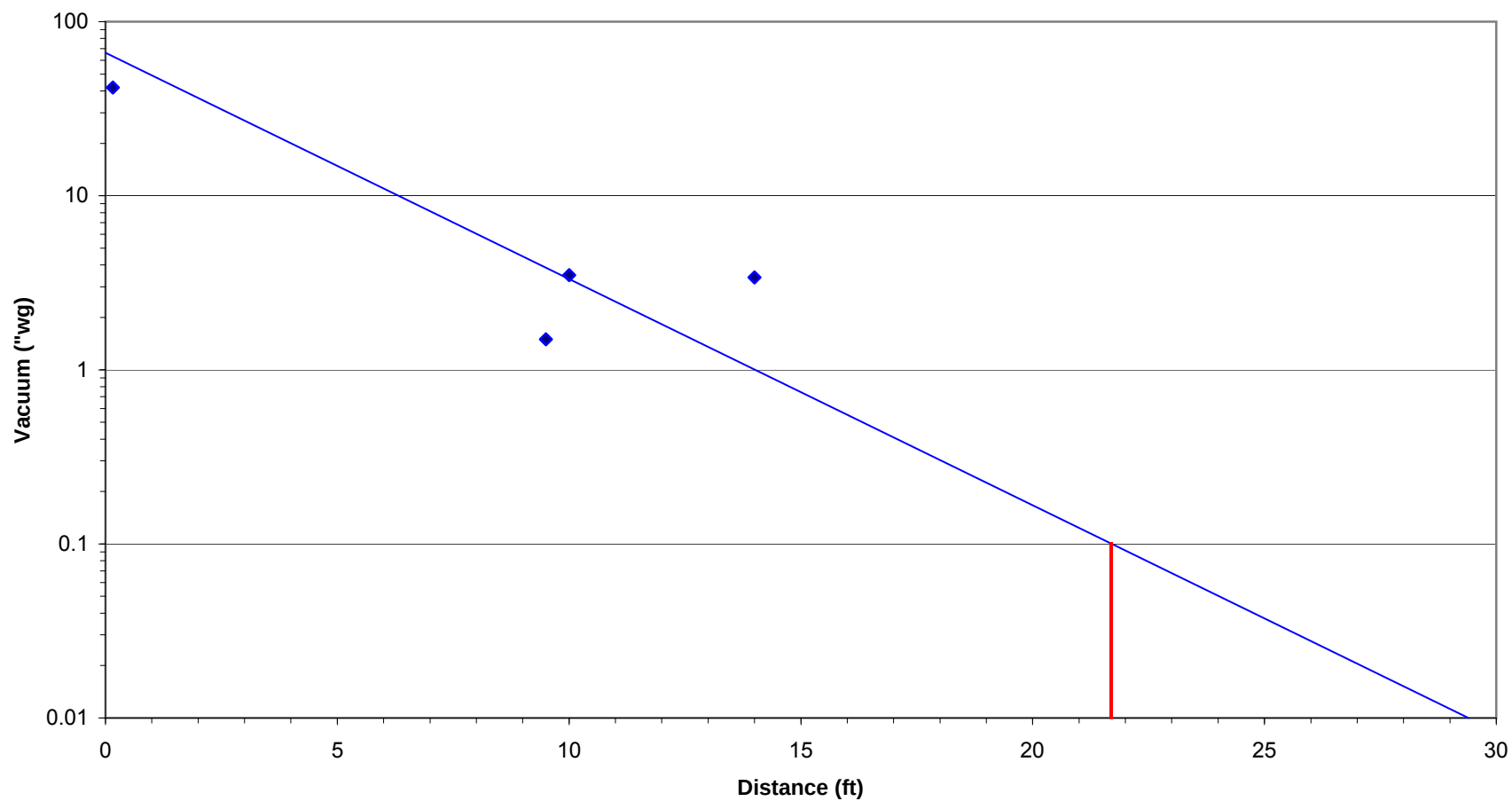


Appendix C

Former Elite Cleaners Step Test - January 19, 2006

Step Test # 2

VEW-2 Flow Rate = 190 scfm

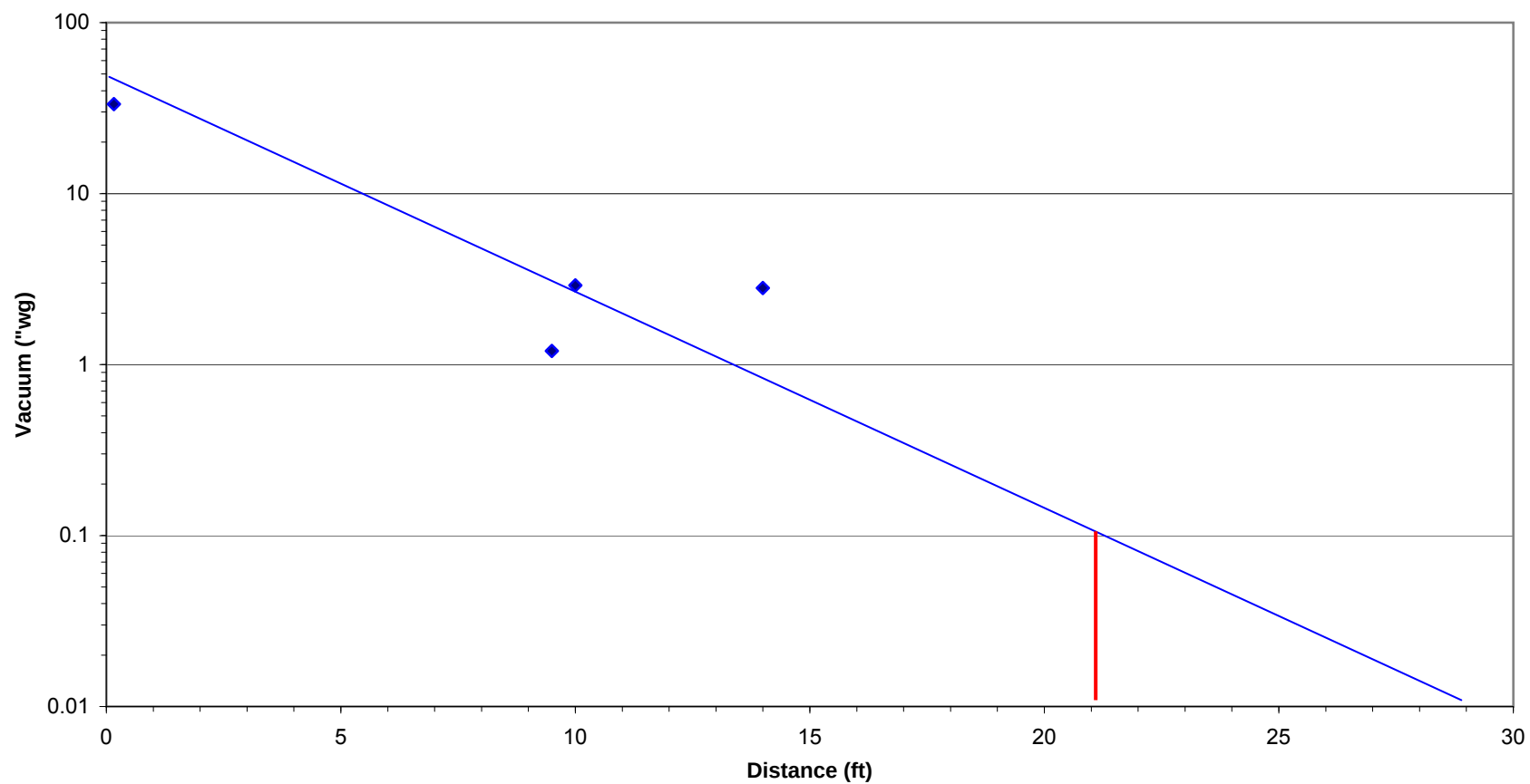


Appendix C

Former Elite Cleaners Step Test - January 19, 2006

Step Test # 3

VEW-2 Flow Rate = 165 scfm

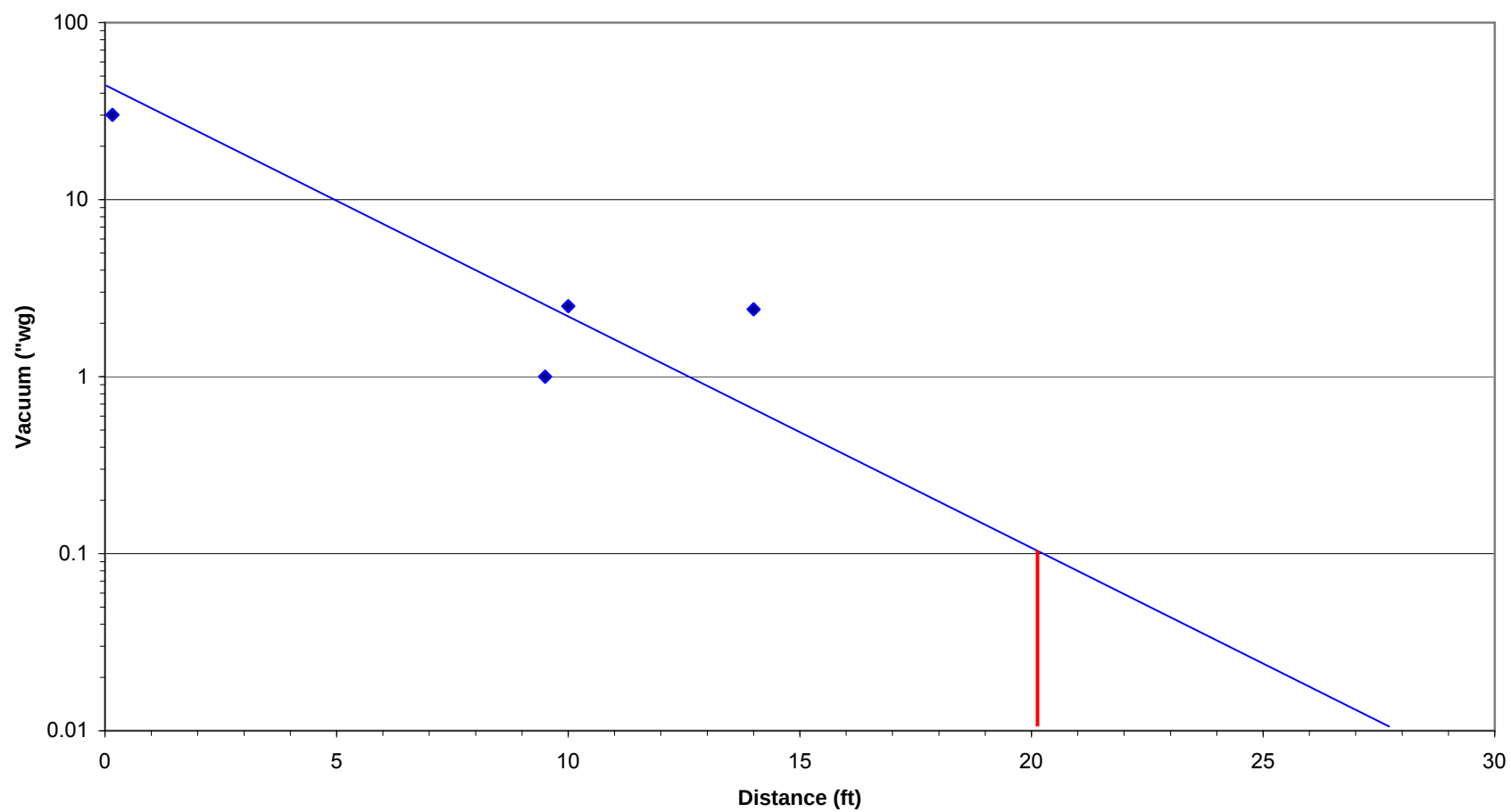


Appendix C

Former Elite Cleaners Step Test - January 19, 2006

Step Test # 4

VEW-2 Flow Rate = 140 scfm

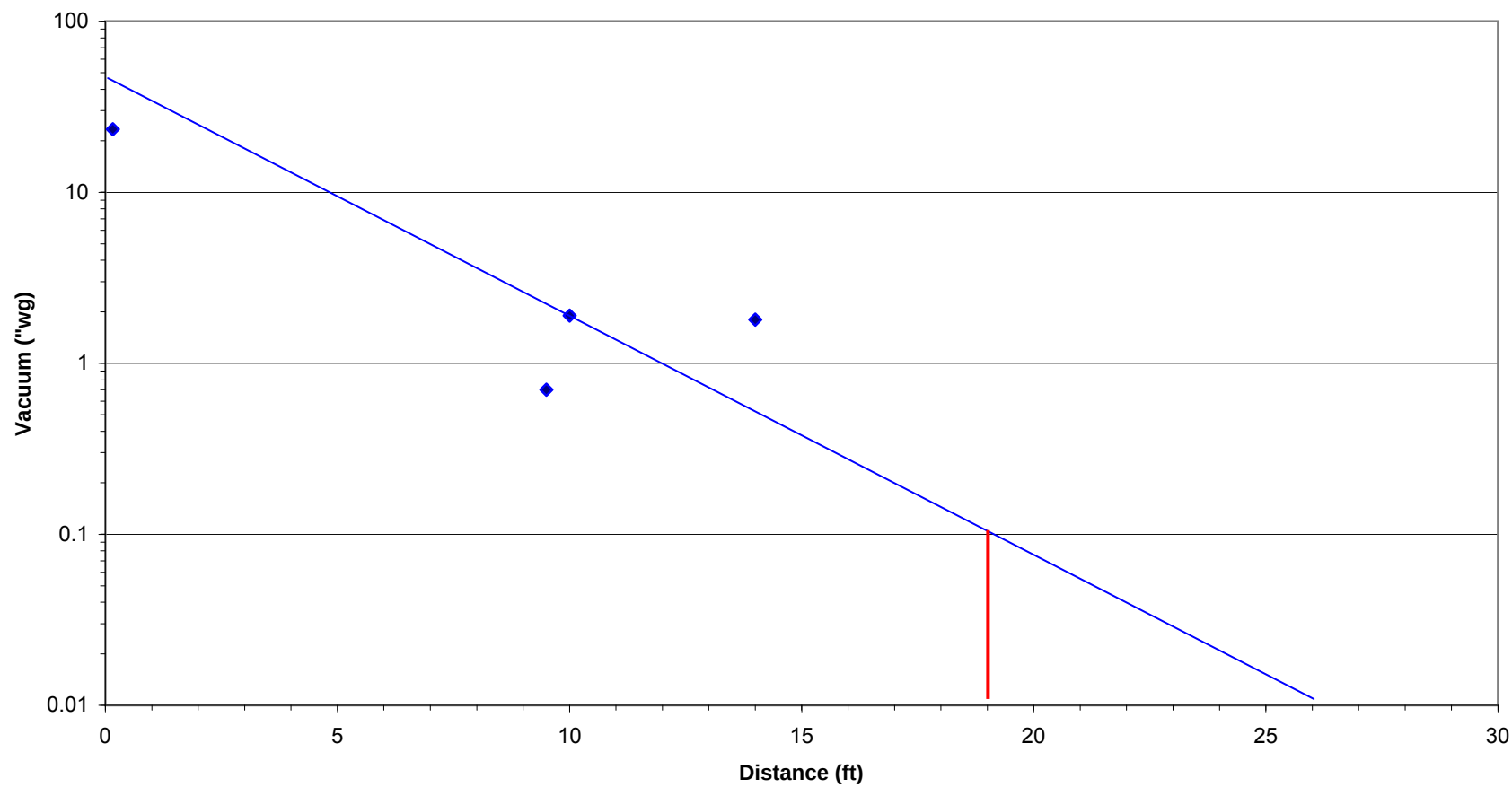


Appendix C

Former Elite Cleaners Step Test - January 19, 2006

Step Test # 5

VEW-2 Flow Rate = 115 scfm

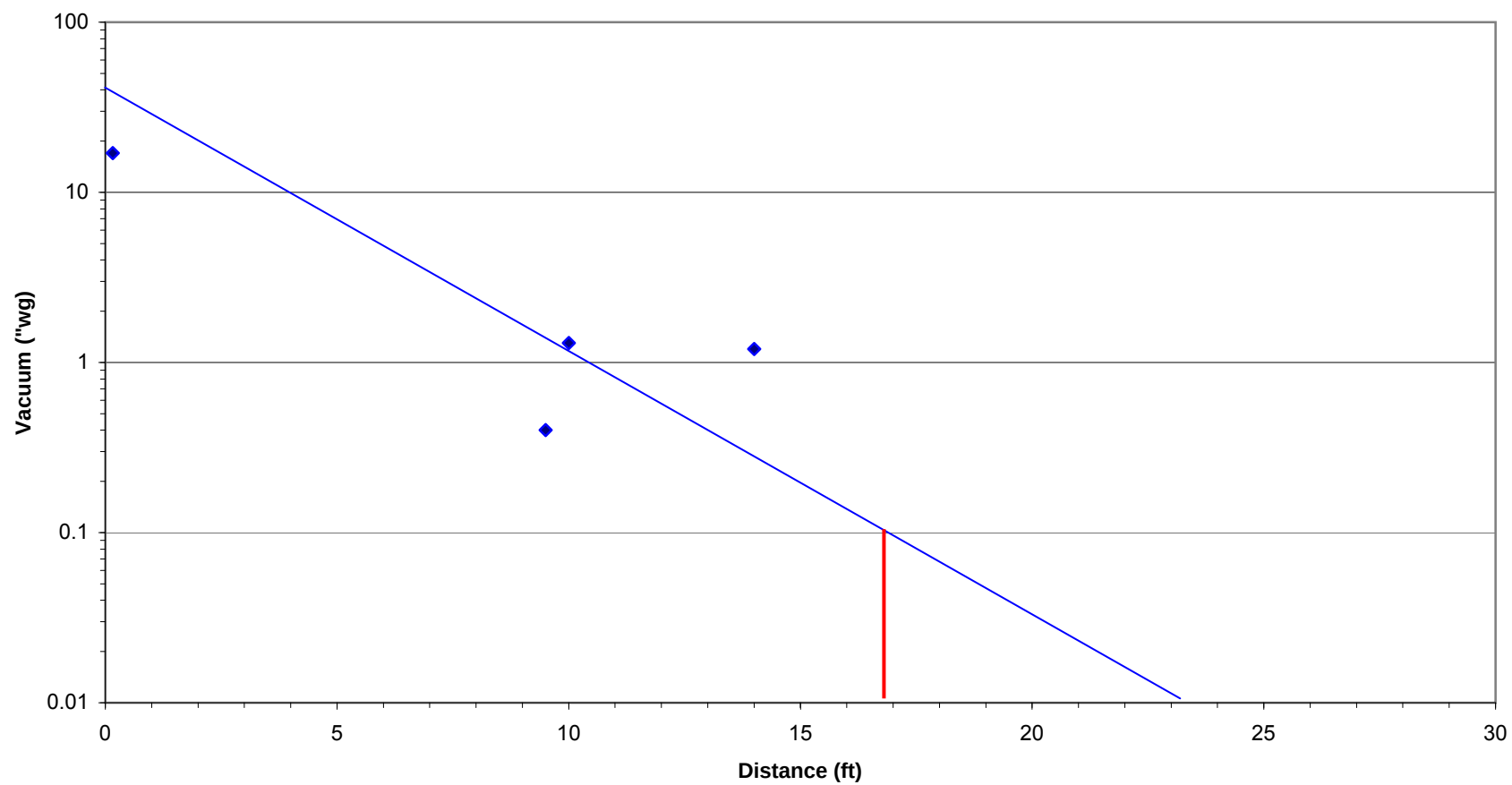


Appendix C

Former Elite Cleaners Step Test - January 19, 2006

Step Test # 6

VEW-2 Flow Rate = 90 scfm



Appendix C

Soil Vapor Extraction System Blower Specification

The design basis for the calculations presented here are based on the Darcy-Weisbach friction factor equation found in the text "Industrial Ventilation" 20th edition, published by the American Conference of Governmental Industrial Hygienists. The equation is:

$$h = f * \frac{L}{d} * VP$$

where,

h = frictional losses in the pipe, "wg
 f = friction factor, dimensionless
 L = piping length, ft
 d = pipe diameter, ft
 VP = air flow velocity pressure, "wg

In order to calculate the applicable friction factor (f), the Churchill correlation will be used. This correlation is given by the following:

$$f = 8 * \left[\frac{[(8)^{12} + (A + B)^{-3/2}]^{1/12}}{(Re)} \right]$$

where,

Re = $\rho dV/u$; ρ =density, V=air velocity, u=air viscosity

$$A = \left\{ \frac{[(7)^{0.9} (k)]}{-2.457 \times \ln \left[\frac{1}{(Re)} + \frac{1}{(3.7d)} \right]} \right\}$$

$$B = (37,530/Re)^{16}$$

K = surface roughness relative to pipe diameter, ft

Additional losses must also be calculated for fittings and system operating units. The velocity pressure method is used to determine the losses through these fittings. Fitting losses are estimated from loss coefficients (K) multiplied by the piping air flow velocity pressure (VP). Fitting loss coefficients were obtained from "Perry's Chemical Engineering Handbook", 6th edition. the relevant equation is:

$$h = k * VP$$

The calculations will be separated into suction-side and pressure-side, based on the blower location. The soil vapor extraction system schematic figure of the text provides the schematic system and a plan view of the piping layout.

Appendix C

Soil Vapor Extraction System Blower Specification

VIEW No. 1 SUCTION-SIDE CALCULATIONS AND DATA:

Expected Air Flow Rate, Q: 120.0 scfm
 Pipe Diameter: 3"
 Air Velocity $[4Q/(60 \times 3.14 \times d^2)]$: 40.74 ft/s
 Air Velocity Pressure $[p \times (V/1096)^2]$: 0.37 "wg
 Length of Straight Pipe: 20 ft

Fittings and Other Losses:	#	K
90 Elbow Sweeps:	6	0.45
60 Elbow Sweeps:	0	0.30
45 Elbow Sweeps:	2	0.23
30 Elbow Sweeps:	0	0.15
Manual Flow Valves:	1	1.00
Bushings at VEW:	0	0.45
4"/3" Reducer at Vacuum Motor:	1	0.21
Branching Tees (30 deg angle):	1	0.18
Total Fitting Loss Factor:		4.54

Other Equipment:	#	hl ("wg)
Air/Water Separator:	0	0.00
Flowmeter :	1	2.00
Particulate Air Filter	0	0.00

Determination of the Churchill friction factor:

$$A = \{-2.457 \ln[(7/Re)^{0.9} + (k/3.7d)]\}^{16}$$

$$B = (37,530/Re)^{16}$$

$$Re = \rho d V / \mu ; \rho = 0.075 \text{ lb/ft}^3, \quad \mu = 1.24 \times 10^{-5} \text{ lb/ft-s}$$

$$= 6.16 \times 10^4$$

$$k = 0.0005 \text{ ft (Absolute surface roughness for PVC)}$$

Therefore,

$$A = 7.41 \times 10^{19} \quad \text{and} \quad B = 3.60 \times 10^{-4}$$

and,

$$f = 8[(8/Re)^{12} + (A + B)^{-3/2}]^{1/12}$$

$$= 0.0263$$

Frictional Loss Calculations:

Total Piping Frictional Loss	0.78	"wg
Total Fitting Frictional Loss	3.69	"wg
Potential(Gravitational) Loss	0.12	"wg
Vacuum @ VEW-1	25.00	"wg
Well Net Suction Head Required	29.59	"wg

Appendix C

Soil Vapor Extraction System Blower Specification

VIEW No. 2 SUCTION-SIDE CALCULATIONS AND DATA:

Expected Air Flow Rate, Q: 120.0 scfm
 Pipe Diameter: 3 "
 Air Velocity $[4Q/(60 \times 3.14 \times d^2)]$: 40.74 ft/s
 Air Velocity Pressure $[p \times (V/1096)^2]$: 0.37 "wg
 Length of Straight Pipe: 50 ft

Fittings and Other Losses:	#	K
90 Elbow Sweeps:	6	0.45
60 Elbow Sweeps:	0	0.30
45 Elbow Sweeps:	2	0.23
30 Elbow Sweeps:	0	0.15
Manual Flow Valves:	1	1.00
Bushings at VEW:	0	0.45
4"/3" Reducer at Vacuum Motor:	1	0.21
Branching Tees (30 deg angle):	1	0.18
Total Fitting Loss Factor:		4.54

Other Equipment:	#	hl ("wg)
Air/Water Separator:	0	0.00
Flowmeter :	1	2.00
Particulate Air Filter	0	0.00

Determination of the Churchill friction factor:

$$A = \{-2.457 \ln[(7/Re)^{0.9} + (k/3.7d)]\}^{16}$$

$$B = (37,530/Re)^{16}$$

$$Re = \rho d V / \mu ; \rho = 0.075 \text{ lb/ft}^3, \quad \mu = 1.24 \times 10^{-5} \text{ lb/ft-s}$$

$$= 6.16 \times 10^4$$

$$k = 0.0005 \text{ ft (Absolute surface roughness for PVC)}$$

Therefore,

$$A = 7.41 \times 10^{19} \quad \text{and} \quad B = 3.60 \times 10^{-4}$$

and,

$$f = 8[(8/Re)^{12} + (A + B)^{-3/2}]^{1/12}$$

$$= 0.0263$$

Frictional Loss Calculations:

Total Piping Frictional Loss	1.96	"wg
Total Fitting Frictional Loss	3.69	"wg
Potential(Gravitational) Loss	0.12	"wg
Vacuum @ VEW-2	25.00	"wg
Well Net Suction Head Required	30.77	"wg

Appendix C

Soil Vapor Extraction System Blower Specification

VIEW No. 3 SUCTION-SIDE CALCULATIONS AND DATA:

Expected Air Flow Rate, Q: 120.0 scfm
 Pipe Diameter: 3 "
 Air Velocity $[4Q/(60 \times 3.14 \times d^2)]$: 40.74 ft/s
 Air Velocity Pressure $[p \times (V/1096)^2]$: 0.37 "wg
 Length of Straight Pipe: 75 ft

Fittings and Other Losses:	#	K
90 Elbow Sweeps:	6	0.45
60 Elbow Sweeps:	0	0.30
45 Elbow Sweeps:	2	0.23
30 Elbow Sweeps:	0	0.15
Manual Flow Valves:	1	1.00
Bushings at VEW:	0	0.45
4"/3" Reducer at Vacuum Motor:	1	0.21
Branching Tees (30 deg angle):	1	0.18
Total Fitting Loss Factor:		4.54

Other Equipment:	#	hl ("wg)
Air/Water Separator:	0	0.00
Flowmeter :	1	2.00
Particulate Air Filter	0	0.00

Determination of the Churchill friction factor:

$$A = \{-2.457 \ln[(7/Re)^{0.9} + (k/3.7d)]\}^{16}$$

$$B = (37,530/Re)^{16}$$

$$Re = \rho d V / \mu ; \rho = 0.075 \text{ lb/ft}^3, \quad \mu = 1.24 \times 10^{-5} \text{ lb/ft-s}$$

$$= 6.16 \times 10^4$$

$$k = 0.0005 \text{ ft (Absolute surface roughness for PVC)}$$

Therefore,

$$A = 7.41 \times 10^{19} \quad \text{and} \quad B = 3.60 \times 10^{-4}$$

and,

$$f = 8[(8/Re)^{12} + (A + B)^{-3/2}]^{1/12}$$

$$= 0.0263$$

Frictional Loss Calculations:

Total Piping Frictional Loss	2.94	"wg
Total Fitting Frictional Loss	3.69	"wg
Potential(Gravitational) Loss	0.12	"wg
Vacuum @ VEW	25.00	"wg
Well Net Suction Head Required	31.75	"wg

Appendix C

Soil Vapor Extraction System Blower Specification

VIEW MANIFOLD SUCTION-SIDE CALCULATIONS AND DATA:

Expected Air Flow Rate, Q: 360.0 scfm
 Pipe Diameter: 4"
 Air Velocity $[4Q/(60 \times 3.14 \times d^2)]$: 68.75 ft/s
 Air Velocity Pressure $[p \times (V/1096)^2]$: 1.06 "wg

Length of Straight Pipe: 5 ft

Fittings and Other Losses:	#	K
90 Elbow Sweeps:	6	0.45
60 Elbow Sweeps:	2	0.30
45 Elbow Sweeps:	4	0.23
30 Elbow Sweeps:	0	0.15
Manual Flow Valves:	3	1.00
Flow Indicator Pitot	2	0.67
4"/3" Reducer at A/W Separator:	1	0.21
4.5"/2.5" Reducer at Particulate Filter:	1	0.35
Branching Tees (30 deg angle):	0	0.18
Total Fitting Loss Factor:		9.10

Other Equipment (from manufacturer):	#	hl ("wg)
Air/Water Separator:	1	0.50
Particulate Air Filter	1	4.00
Carbon Off-gas Units	1	4.00

Determination of the Churchill friction factor:

$$A = \{-2.457 \ln[(7/Re)^{0.9} + (k/3.7d)]\}^{16}$$

$$B = (37,530/Re)^{16}$$

$$Re = \rho d V / \mu ; \rho = 0.075 \text{ lb/ft}^3, \quad \mu = 1.24E-05 \text{ lb/ft-s}$$

$$= 1.04E+05$$

$$k = 0.0005 \text{ ft (Absolute surface roughness for PVC)}$$

Therefore,

$$A = 7.41E+19 \text{ and } B = 8.32E-08$$

and,

$$f = 8[(8/Re)^{12} + (A + B)^{-3/2}]^{1/12}$$

$$= 0.026263329$$

Frictional Loss Calculations:

Total Piping Frictional Loss	0.42	"wg
Total Fitting Frictional Loss	18.17	"wg
Potential(Gravitational) Loss	0.12	"wg
Maximum Suction Required @ VEW'S	31.75	"wg
System Net Suction Head Required	50.46	"wg

Appendix C

Soil Vapor Extraction System Blower Specification

SYSTEM PRESSURE-SIDE CALCULATIONS AND DATA:

From Blower to Stack

Expected Air Flow Rate, Q: 360.0 scfm
 Pipe Diameter: 4 "
 Air Velocity $[4Q/(60 \cdot 3.14 \cdot d^2)]$: 68.75 ft/s
 Air Velocity Pressure $[p \cdot (V/1096)^2]$: 1.06 "wg

Length of Straight Pipe: 20 ft

Fittings and Other Losses:	#	K
90 Elbow Sweeps:	2	0.45
60 Elbow Sweeps:	0	0.30
45 Elbow Sweeps:	0	0.23
30 Elbow Sweeps:	0	0.15
Manual Flow Valves:	0	1.00
2.5"/3" Reducer at Blower Exhaust:	0	0.18
Branching Tees:	0	1.00
Total Fitting Loss Factor:		0.90

Determination of the Churchill friction factor:

$$A = \{-2.457 \ln[(7/Re)^{0.9} + (k/3.7d)]\}^{16}$$

$$B = (37,530/Re)^{16}$$

$$Re = \rho d V / \mu ; \rho = 0.075 \text{ lb/ft}^3, \quad \mu = 1.24E-05 \text{ lb/ft-s}$$

$$= 1.39E+05$$

$$k = 0.0005 \text{ ft (Absolute surface roughness for PVC)}$$

Therefore,

$$A = 1.85E+20 \quad \text{and} \quad B = 8.33E-10$$

and,

$$f = 8[(8/Re)^{12} + (A + B)^{-3/2}]^{1/12}$$

$$= 0.0234$$

Frictional Loss Calculations:

Total Piping Frictional Loss	1.49	"wg
Total Fitting Frictional Loss	0.96	"wg
Potential(Gravitational) Loss	0.43	"wg
System Net Pressure Head Req'd.	2.88	"wg

Appendix C

Soil Vapor Extraction System Blower Specification

VAPOR EXTRACTION SYSTEM BLOWER SELECTION

BLOWER SPECIFICATION :

NET SUCTION HEAD	=	50.46 "wg
NET PRESSURE HEAD	=	2.88 "wg
		53.34 "wg
SAFETY FACTOR	=	1.25
		67 "wg
DESIGN FLOW RATE	=	360 scfm

Based on availability of equipment in FDEP stock, the following explosion proof Rotron Regenerative Blower has been selected:

Rotron EN909BG72WL, 410 scfm @ 63 "wg (60Hz) , 15 HP, 3-phase, XP

Note: Selected system is equipped with variable speed drive to adjust system to meet site requirements.

The following moisture separator has been selected:

Rotron MS600B

The following particulate filter and silencer has been selected:

Rotron #516465

Rotron #516264 (Muffler)

The following carbon vessel has been selected (1 qty):

Tetrasolv VR-140

PREPARED BY: M.Sanchez

REVIEWED BY:

DATE



Appendix D



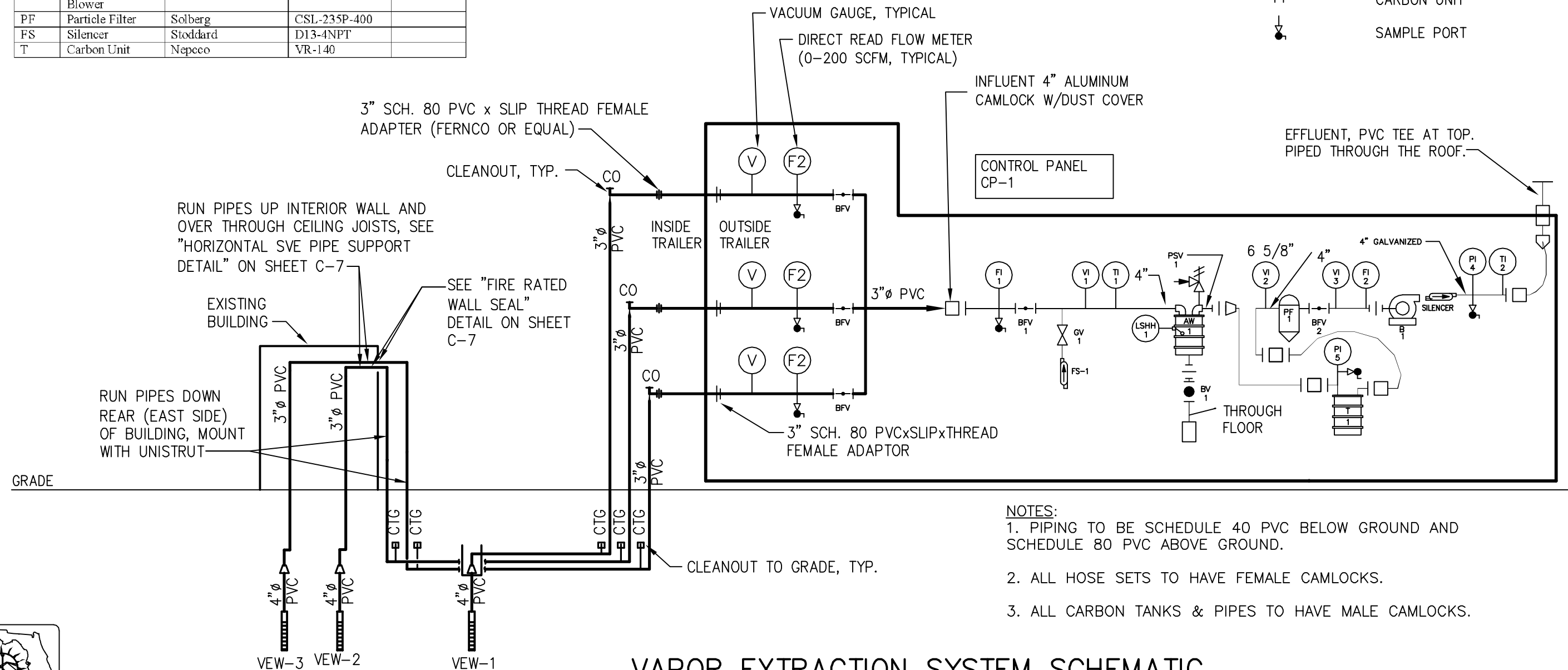
Construction Plans



<u>TRAILER EQUIPMENT SCHEDULE:</u>				
ID	DESCRIPTION	MANUFACTURER	MODEL	RANGE
F1	Flow Indicator	Dwyer	DS-300-4	200-700 SCFM
V1	Vacuum Gauge	Winter's	P343V	0-100" W.C.
T1	Temperature Gauge	Winter's	T30025-B8	0-250 F
LSHH	Level Switch	Madison	M7700	
F2	Flow Indicator	Rotron	FM30C250Q	50-250 SCFM
P1	Pressure Gauge	Winter's	P340	0-15" W.C.
AW	Moisture Separator	Rotron	MS600B	
B	Regenerative Blower	Rotron	EN909BG72WL	
PF	Particle Filter	Solberg	CSL-235P-400	
FS	Silencer	Stoddard	D13-4NPT	
T	Carbon Unit	Nepco	VR-140	

LEGEND AND
ABBREVIATIONS:

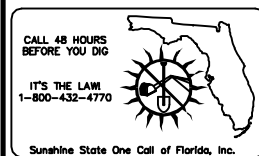
FI	FLOW METER
BFV	BUTTERFLY VALVE
BV	BALL VALVE
GV	GATE VALVE
FS	SILENCER
PI	PRESSURE GAUGE
TI	TEMPERATURE GAUGE
PSV	VACUUM RELIEF VALVE
AW	AIR/WATER SEPARATOR
LSHH	AW HIGH WATER SHUTOFF
PF	SWITCH
B	PARTICULATE FILTER
T	BLOWER
PI	CARBON UNIT
	SAMPLE PORT



- NOTES:
1. PIPING TO BE SCHEDULE 40 PVC BELOW GROUND AND SCHEDULE 80 PVC ABOVE GROUND.
 2. ALL HOSE SETS TO HAVE FEMALE CAMLOCKS.
 3. ALL CARBON TANKS & PIPES TO HAVE MALE CAMLOCKS.

VAPOR EXTRACTION SYSTEM SCHEMATIC

NOT TO SCALE



NUMBER	DATE	MADE BY	CHECKED	DESCRIPTION
REVISIONS				

METCALF & EDDY | AECOM

13450 W. SUNRISE BLVD., SUITE 200
SUNRISE, FLORIDA 33323
(954) 745-7200

DATE _____
SCOTT BUCK
PROFESSIONAL ENGINEER
FLORIDA PROFESSIONAL LICENSE NO. 49923

DESIGNED BY:

DRAWN BY:

DEPT. CHECK:

PROJ. CHECK:

SCALE:

NTS

UNLESS OTHERWISE NOTED OR CHANGED BY REPRODUCTION

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION - FDEP FACILITY ID #08600002
FORMER UR BRITE CLEANERS
3230 NORTH STATE ROAD 7, LAUDERDALE LAKES, FL

VAPOR EXTRACTION SYSTEM SCHEMATIC

CIVIL/MECHANICAL

07/26/07

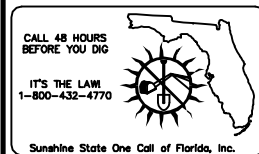
JOB 60022124

FILE NO. —

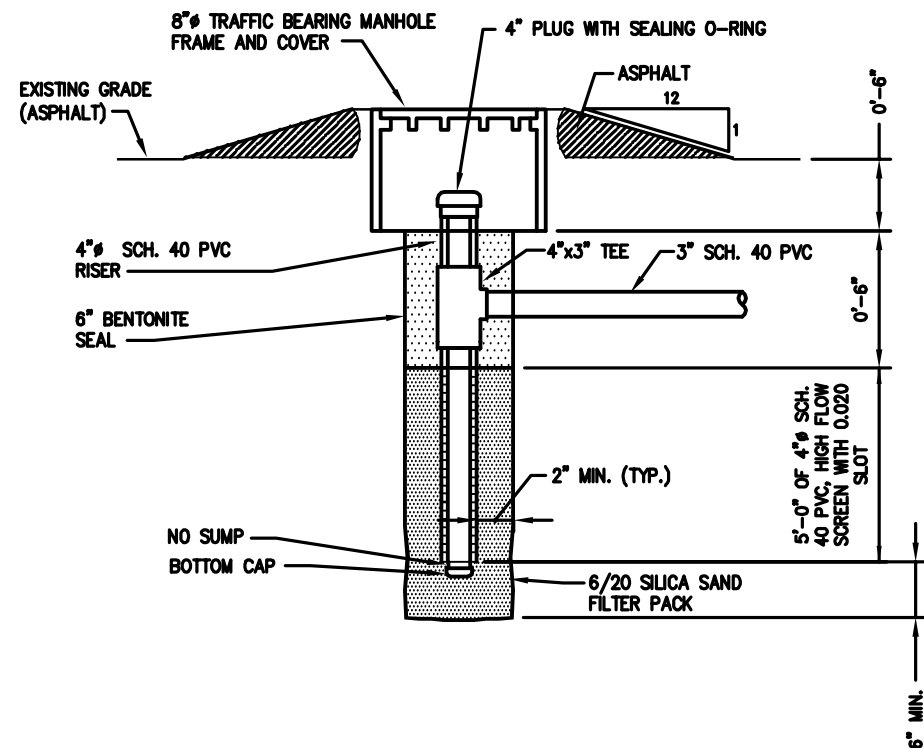
CAD FILE WIURB1_8

SHEET **C-2**

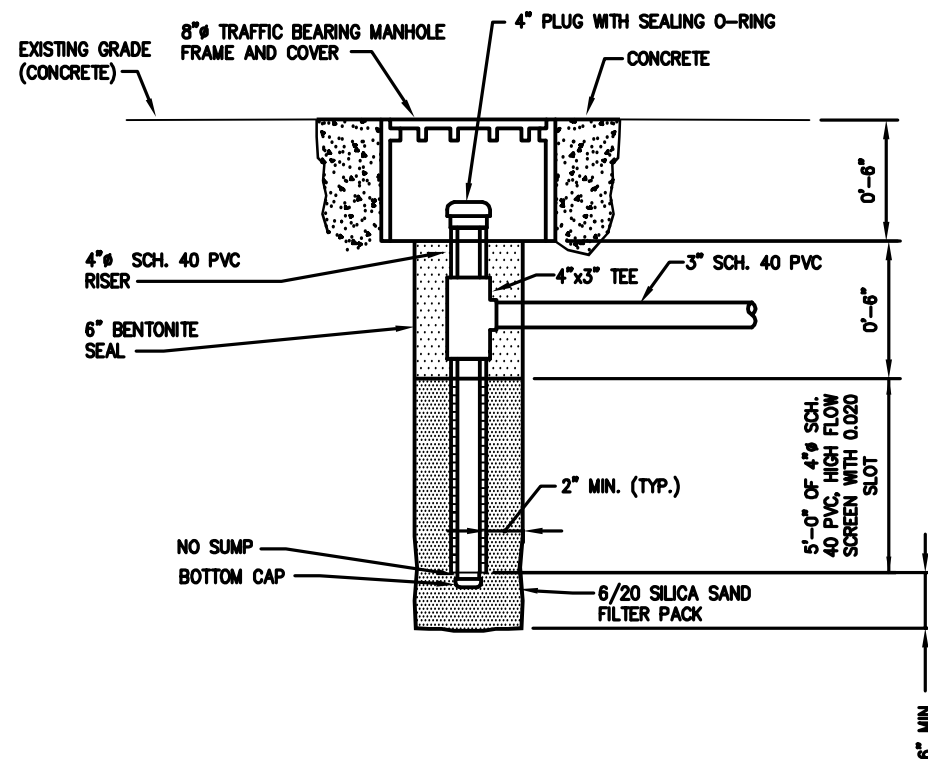
1. SAW-CUT AND TRENCH FOR ALL UNDERGROUND PIPING (SEE DETAILS ON SHEET C-5).
2. INSTALL VES TRAILER (APPROX. SIZE 12'Lx8'Wx8'H).
3. VES TRAILER TO BE PROVIDED WITH (5) 55-GALLON BARRELS WITH REFLECTIVE TAPE AS PROTECTIVE BARRICADES AROUND TRAILER. BARRELS SHALL BE PLACARDED IN ACCORDANCE WITH CH. 62-730 FAC. FILL BARRELS WITH WATER.
4. FURNISH AND INSTALL PIPE AND CONDUIT SHOWN.
5. FURNISH AND INSTALL VAPOR EXTRACTION WELLS VEW-1 THRU 3.
6. PROVIDE 100 AMP 208V, 3 PHASE SERVICE, CONTROL PANEL AND TEMPORARY ELECTRICAL SERVICE.
7. FURNISH AND INSTALL VACUUM MONITORING POINTS VMP-1 THRU 3.
8. ALL UNDERGROUND WORK TO COMPLY WITH THE FLORIDA TRENCH SAFETY ACT, SECTIONS 553.60 THROUGH 553.64 F.S. AND UNDERGROUND FACILITY DAMAGE PREVENTION AND SAFETY SECTIONS 556.101 THROUGH 553.111 F.S.
9. CONTRACTOR TO PROVIDE SITE SAFETY PLAN. SITE SAFETY PLAN IN ACCORDANCE WITH OSHA AND 29 CFR REQUIREMENTS.
10. BACKFILL ALL EXCAVATED TRENCHES WITH CLEAN, GRANULAR FILL. RESTORE ALL EXCAVATED AREAS TO ORIGINAL CONDITION IN ACCORDANCE WITH DRAWINGS.
11. CONTRACTOR TO PROVIDE CONCRETE SLAB AS DETAILED ON THE VERTICAL VAPOR EXTRACTION WELL (VEW-1) DETAIL.
12. CONTRACTOR SHALL MAKE EVERY EFFORT TO MINIMIZE DISRUPTION TO EXISTING BUSINESSES AND SHALL COORDINATE EXCAVATION AND CONCRETE POUR WITH THE BUSINESS MANAGERS. UTILITIES AND SITE CONDITIONS SHOWN ARE APPROXIMATE. CONTRACTOR TO VERIFY ALL EXISTING CONDITIONS AND DIMENSIONS BEFORE STARTING WORK.
13. ALL EQUIPMENT, GAUGES, PIPE AND CONDUIT NECESSARY MAY NOT BE SHOWN FOR CLARITY. THE CONTRACTOR IS RESPONSIBLE FOR SUCH ITEMS.
14. THE SCOPE OF WORK FOR THIS PROJECT DOES NOT REQUIRE THE USE OF ANY GASES NOR ANY HAZARDOUS MATERIALS/WASTE STORAGE ON SITE. THE CARBON UNITS SHOWN ON THE DRAWINGS SHALL BE USED TO TREAT EXTRACTED SOIL VAPORS FOR APPROXIMATELY 60 DAYS. THE CARBONS UNITS SHALL THEN BE REMOVED AND DISPOSED OF.
15. ESTIMATED TIME OF TRAILER ONSITE IS 1 YEAR.
16. ACCESS TO RIGHT-OF-WAY COORDINATED WITH CITY UTILITIES SERVICES DEPT., FLORIDA PUBLIC UTILITIES, ADELPHIA CABLE, FLORIDA POWER & LIGHT, BELL SOUTH AND BELL SOUTH COMMUNICATION.



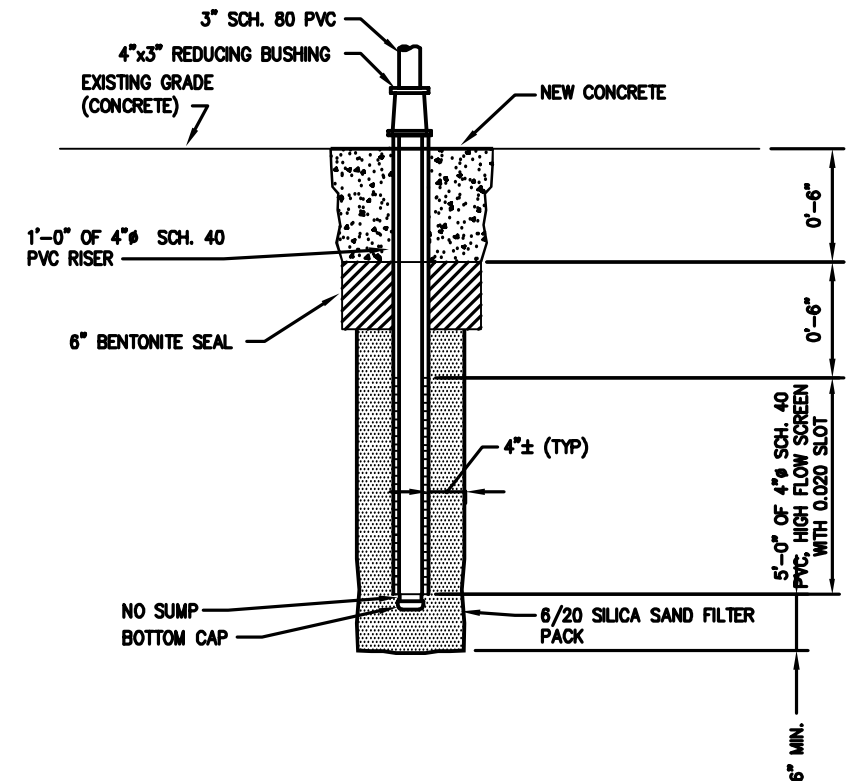
				METCALF & EDDY AECOM 13450 W. SUNRISE BLVD., SUITE 200 SUNRISE, FLORIDA 33323 (954) 745-7200		DESIGNED BY: DRAWN BY: A. WALKER DEPT. CHECK: PROJ. CHECK:		SCALE: NTS UNLESS OTHERWISE NOTED OR CHANGED BY REPRODUCTION		FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION - FDEP FACILITY ID #09000002 FORMER UR BRITE CLEANERS 3230 NORTH STATE ROAD 7, LAUDERDALE LAKES, FL GENERAL DESCRIPTION OF WORK CIVIL/MECHANICAL 07/26/07				JOB 60022124 FILE NO. CAD FILE WIURB1_8 SHEET C-3									
<table><tr><td>NUMBER</td><td>DATE</td><td>MADE BY</td><td>CHECKED</td><td>DESCRIPTION</td></tr><tr><td colspan="5">REVISIONS</td></tr></table>				NUMBER	DATE	MADE BY	CHECKED	DESCRIPTION	REVISIONS					DATE SCOTT BUCK PROFESSIONAL ENGINEER FLORIDA PROFESSIONAL LICENSE NO. 49923									
NUMBER	DATE	MADE BY	CHECKED	DESCRIPTION																			
REVISIONS																							



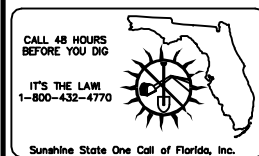
VERTICAL VAPOR
EXTRACTION WELL (VEW-1)
NOT TO SCALE



VERTICAL VAPOR
EXTRACTION WELL (VEW-2)
NOT TO SCALE



VERTICAL VAPOR EXTRACTION
WELL (VEW-3)
NOT TO SCALE

[illegible]

METCALF & EDDY | AECOM

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SUNRISE, FLORIDA 33323
(954) 745-7200

DATE _____
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FLORIDA PROFESSIONAL LICENSE NO. 49923

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FORMER UR BRITE CLEANERS
3230 NORTH STATE ROAD 7, LAUDERDALE LAKES, FL

DETAILS I

CIVIL/MECHANICAL

07/26/07

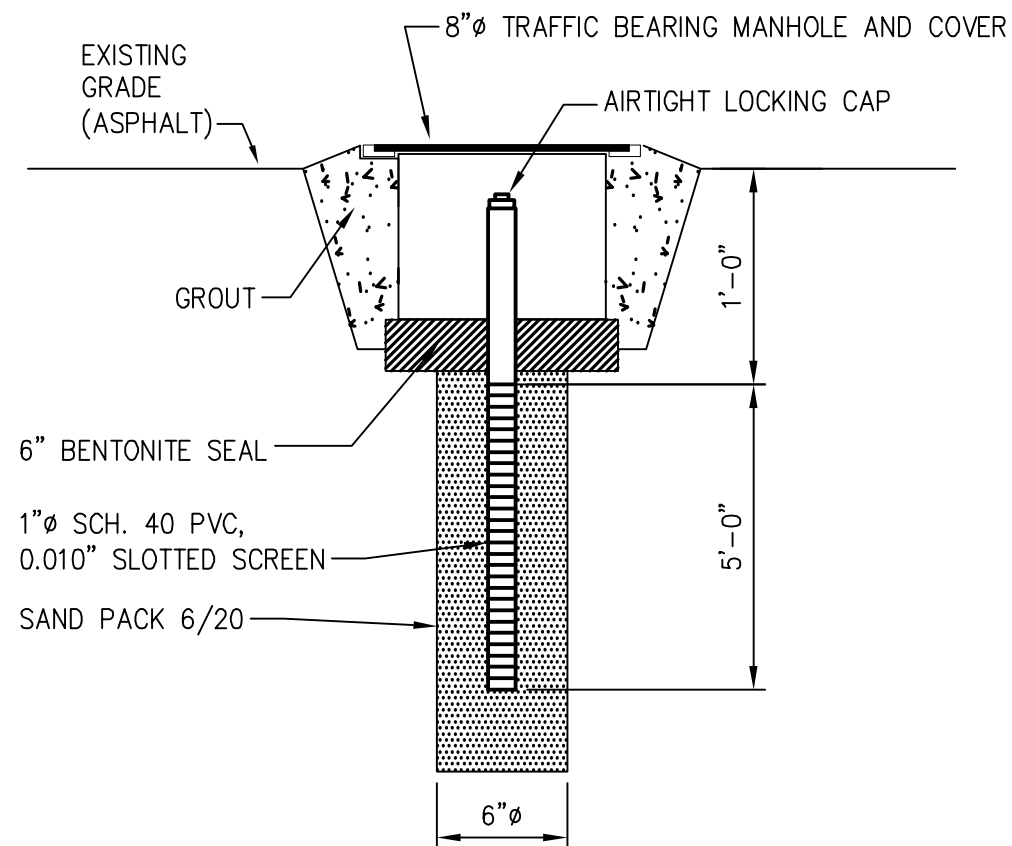
JOB 60022124

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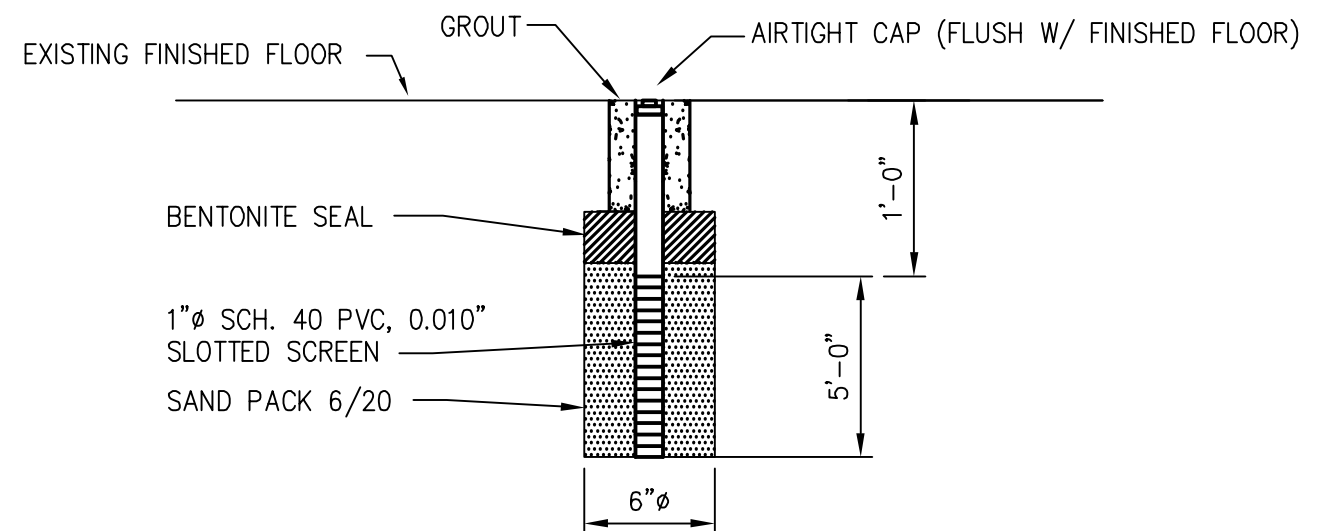
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SHEET C-4

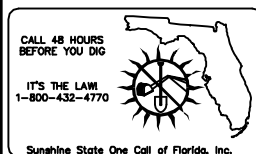
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VACUUM MONITORING POINT
(VMP-1)
NOT TO SCALE



VACUUM MONITORING POINT
(VMP-2 & 3)
NOT TO SCALE

[illegible]

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SUNRISE, FLORIDA 33323
(954) 745-7200

DATE _____
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PROFESSIONAL ENGINEER
FLORIDA PROFESSIONAL LICENSE NO. 49923

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DRAWN BY:
A. WALKER

DEPT. CHECK:

PROJ. CHECK:

SCALE:

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FORMER UR BRITE CLEANERS
3230 NORTH STATE ROAD 7, LAUDERDALE LAKES, FL

DETAILS II

CIVIL/MECHANICAL

07/26/07

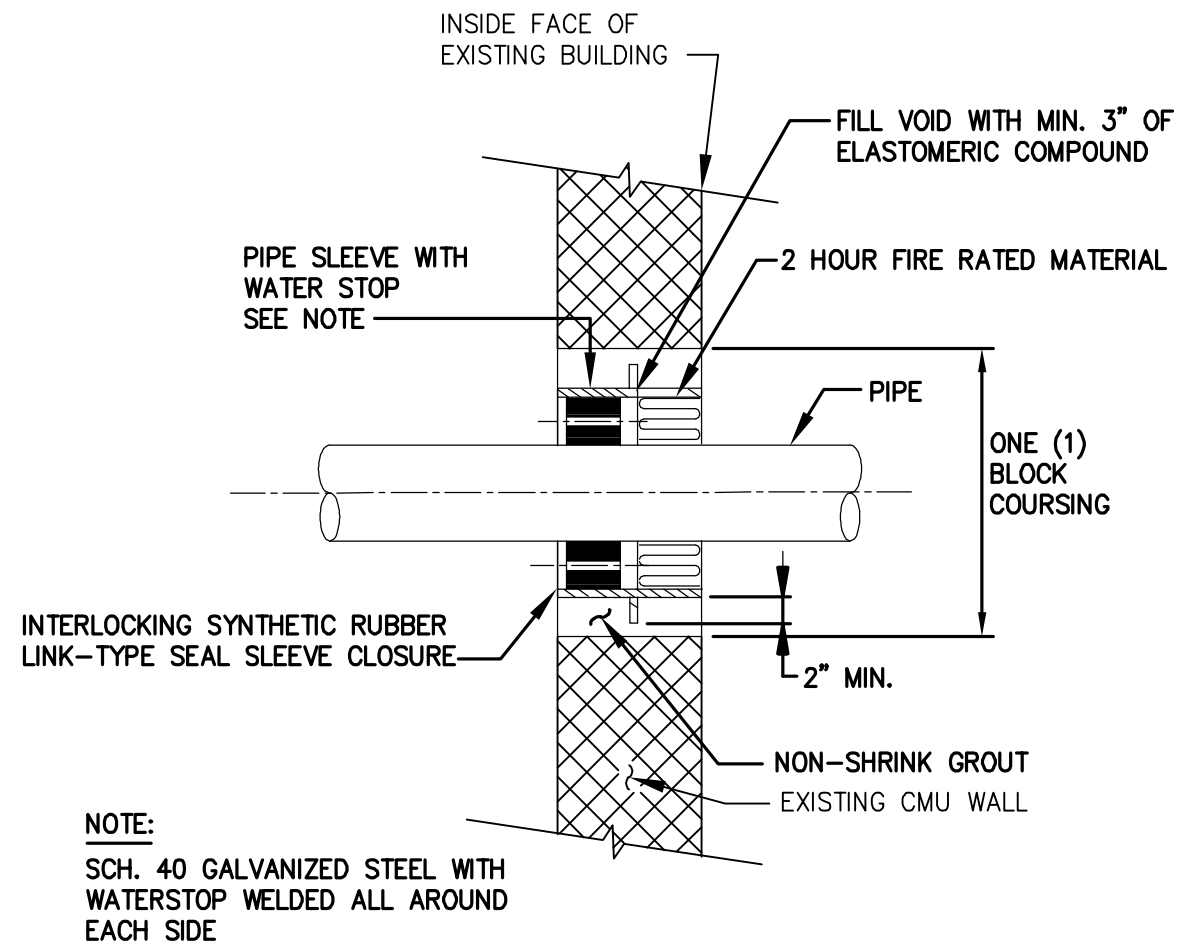
JOB 60022124

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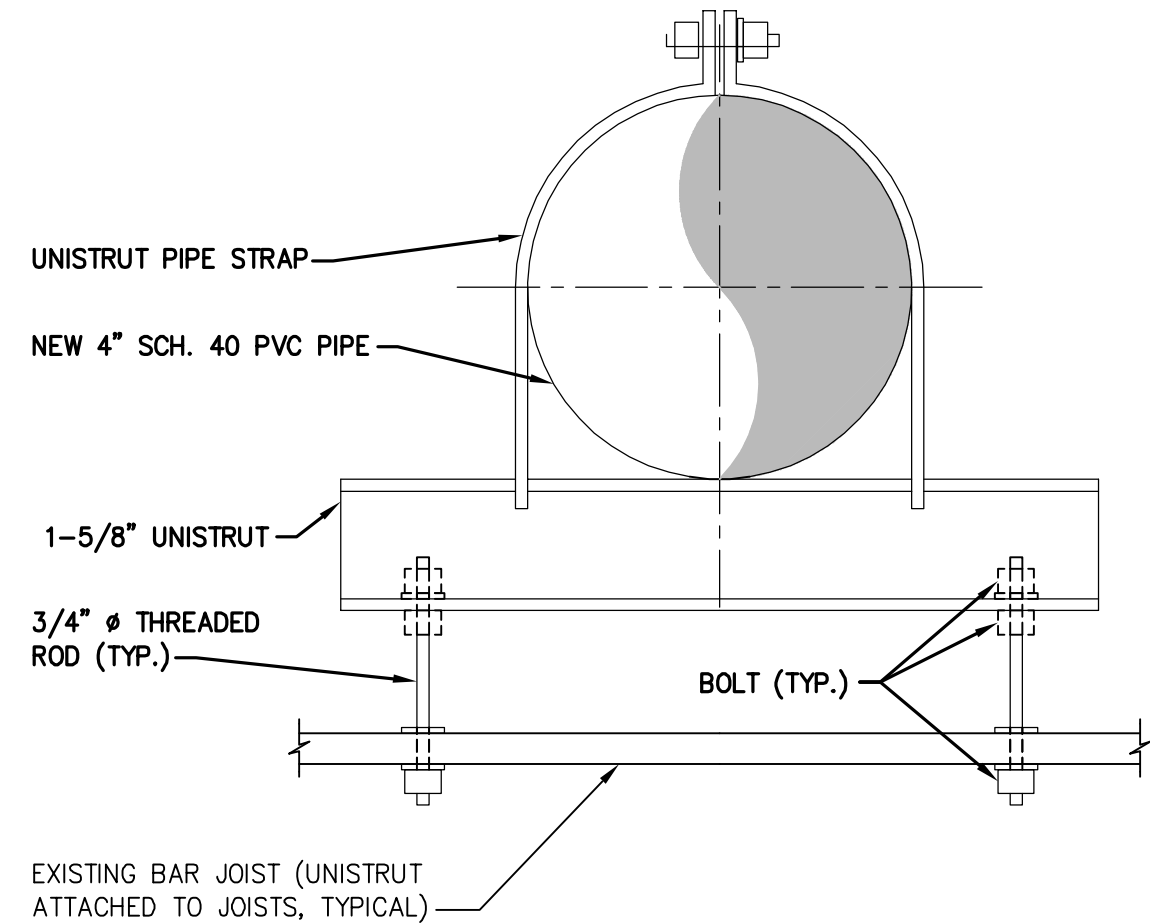
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SHEET **C-5**

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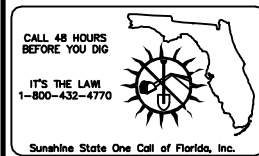


FIRE RATED WALL SEAL
NOT TO SCALE



HORIZONTAL SVE PIPE SUPPORT DETAIL

NOT TO SCALE



PREPARED BY: _____ CHECKED BY: _____ DATE: _____					
NUMBER	DATE	MADE BY	CHECKED	DESCRIPTION	
REVISIONS					

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DRAWN BY:
A. WALKER

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SCALE:

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3230 NORTH STATE ROAD 7, LAUDERDALE LAKES, FL

DETAILS IV

CIVIL/MECHANICAL

07/26/07

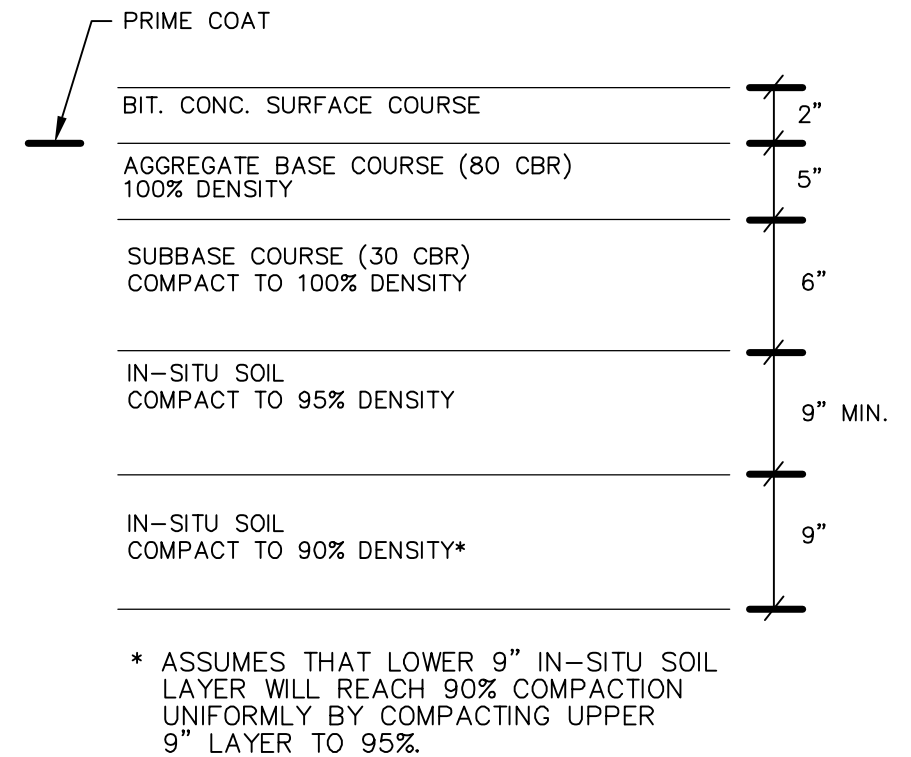
JOB 60022124

FILE NO. _____

CAD FILE WIURB1_8

SHEET C-7

1. ALL WORK SHALL CONFORM TO THE AMERICAN CONCRETE INSTITUTE STANDARD ACI 318-01.
2. ALL CONCRETE SHALL HAVE A 28 DAY COMPRESSIVE STRENGTH OF 4000 PSI UNLESS SPECIFIED OTHERWISE. THE SLUMP SHALL NOT EXCEED 4 INCHES.
3. CEMENT SHALL BE PORTLAND CEMENT, TYPE II, ASTM C150. FINE AGGREGATE SHALL BE NATURAL SAND, ASTM C33. COURSE AGGREGATE SHALL BE CRUSHED STONE OR GRAVEL, ASTM C33.
4. REINFORCING STEEL SHALL CONFORM TO ASTM A615 AND ASTM 165 (FOR WWM), GRADE 60, AND SHALL BE PLACED IN ACCORDANCE WITH THE "MANUAL OF STANDARD PRACTICE", LATEST EDITION, BY THE CONCRETE REINFORCING STEEL INSTITUTE.
5. EXISTING CONCRETE WHICH CONTACTS NEW CONCRETE SHALL BE THOROUGHLY CLEANED BEFORE PLACEMENT OF NEW CONCRETE, UNLESS SHOWN OTHERWISE. EXISTING CONCRETE SHALL BE COATED WITH A BONDING AGENT (SIKADUR 32, OR HI-MOD OR APPROVED EQUAL) PRIOR TO PLACEMENT OF NEW CONCRETE.
6. THE ALLOWABLE BEARING CAPACITY FOLLOWING PREPARATION OF THE SITE SHALL BE A MINIMUM OF 2,500 PSF.
7. PRIOR TO PLACING CONCRETE OR GROUT, THE CONTRACTOR SHALL VERIFY THE SIZE AND LOCATION OF ANY EXISTING WORK WHICH AFFECTS HIS WORK AND ANY DISCREPANCIES FOUND SHALL BE IMMEDIATELY REPORTED TO THE ENGINEER.
8. COMPACT SUBBASE AND GRADE IN ACCORDANCE WITH FDOT STANDARDS. COMPACTION TESTING REPORT TO BE PROVIDED TO THE ENGINEER OF RECORD PRIOR TO CONCRETE PLACEMENT.
9. CONCRETE SHALL BE CURED IN ACCORDANCE WITH ACI 308.
10. CONCRETE SHALL BE CONSOLIDATED IN ACCORDANCE WITH ACI 309, CHAPTER 11.
11. CONCRETE SHALL BE INSPECTED IN ACCORDANCE WITH ACI 311.
12. HOT WEATHER PLACEMENT SHALL BE PERFORMED IN ACCORDANCE WITH ACI 305.
13. PRIOR TO CONCRETE POUR FOR ALL CAST IN PLACE CONCRETE, THE ENGINEER OF RECORD MUST INSPECT AND SIGN OFF THAT THE SLAB DIMENSIONS AND REBAR PLACEMENT WAS CONSTRUCTED IN ACCORDANCE WITH THE PLANS.
14. DESIGN AND CONSTRUCTION SHALL BE DONE IN ACCORDANCE WITH FLORIDA BUILDING CODE REQUIREMENTS.



BITUMINOUS CONCRETE
PAVING—TYPICAL
SECTION
NOT TO SCALE

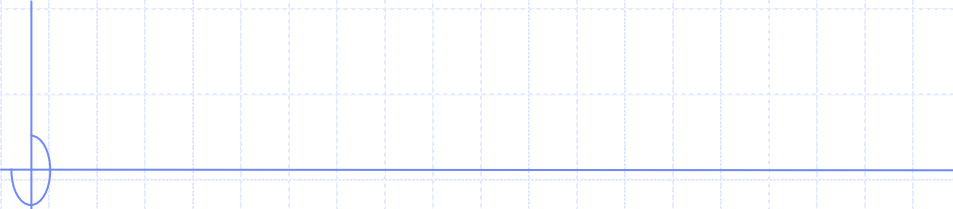
CALL 48 HOURS
BEFORE YOU DIG

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1-800-432-4770



Sunshine State One Call of Florida, Inc.

					DESIGNED BY: METCALF & EDDY AECOM 13450 W. SUNRISE BLVD., SUITE 200 SUNRISE, FLORIDA 33323 (954) 745-7200		SCALE: NTS		FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION - FDEP FACILITY ID #00000002 FORMER UR BRITE CLEANERS 3230 NORTH STATE ROAD 7, LAUDERDALE LAKES, FL		JOB _____ 60022124	
					DATE _____ SCOTT BUCK PROFESSIONAL ENGINEER FLORIDA PROFESSIONAL LICENSE NO. 49923		DRAWN BY: A. WALKER				FILE NO. _____	
							DEPT. CHECK:				CAD FILE _____ WIURB1_8	
							PROJ. CHECK:		DETAILS V AND NOTES		SHEET _____ C-8	
NUMBER DATE MADE BY CHECKED DESCRIPTION							UNLESS OTHERWISE NOTED OR CHANGED BY REPRODUCTION		CIVIL/MECHANICAL		07/26/07	
REVISIONS												



Appendix E

Equipment Specifications



Welcome!

Thank you for choosing NEPCCO SYSTEMS as your equipment supplier. At NEPCCO SYSTEMS, we are committed to developing outstanding products that are easy to use; our goal is to significantly enhance your productivity.

We are equally committed to providing you with the highest standard of service and support after you have purchased a NEPCCO SYSTEMS product. We believe that the quality of our support and customer service is as important as the quality of our products.

Please don't hesitate to let me know how we are doing. It is through your comments and suggestions that we learn how we can continue to improve our products and services. Our toll free Customer Support No. is 800-277-3279.

We value you as a customer, and we want you to be as pleased with your NEPCCO SYSTEMS product as we are in bringing it to you.

Sincerely,

Thomas Norman

Thomas Norman
Customer Quality Assurance



NEPCCO Standard Equipment Limited Warranty

- (a) NEPCCO warrants that any Equipment which it manufactures will be free from substantial defect in material and workmanship for a period of one (1) year from the date such goods are delivered to a carrier by NEPCCO for shipment to the Customer.
- (b) The Customer agrees that the liability of NEPCCO hereunder shall be limited to replacing, repairing, or issuing credit for, at NEPCCO's discretion, any Equipment which is returned FOB NEPCCO's plant within the applicable term of the warranty, provided that (i) upon examination of the Equipment NEPCCO determines that the alleged defect constitutes a substantial defect, and (ii) the warranty made herein is not invalid pursuant to Section (d) hereof. The Customer agrees that such replacement, repair, or credit shall be its sole and exclusive remedies hereunder. For purposes hereof, a substantial defect shall mean any defect which prevents the Equipment from operating in accordance with NEPCCO's published specifications. In the event that NEPCCO determines that Equipment which is no longer manufactured by it contains a substantial defect and the warranty covering the defective equipment is not invalid pursuant to Section (d) hereof, the Customer's sole and exclusive remedy hereunder shall be the repair of such Equipment or the replacement of such Equipment with new equipment at NEPCCO's discretion. In no case is Equipment to be returned by the Customer without first obtaining a Return Authorization number from NEPCCO. Equipment which is repaired or replaced pursuant to this warranty shall continue to be warranted for the unexpired portion of the warranty term applicable to the Equipment so repaired or replaced. NEPCCO shall make the final determination as to the existence or cause of any alleged defect.
- (c) The foregoing warranty shall not be valid (i) if the alleged defect is the result of abuse, misuse, accident, alteration, neglect, or unauthorized repair; (ii) if NEPCCO requires installation of Equipment by specifically approved NEPCCO employee and such installation is not effected, or the Equipment is otherwise installed improperly. Any repair shall be deemed unauthorized unless it is made (i) by NEPCCO or duly authorized agent of NEPCCO or (ii) with the written consent of NEPCCO.
- (d) The operating performance of treatment, abatement and recovery Equipment and systems is affected by factors unrelated to their manufacture, including operating environment and such conditions of use as contaminant and related substance build-up, the frequency and type of operator maintenance and other external variables. For these reasons, specific levels of performance cannot be guaranteed for such Equipment and systems.
- (e) THIS WARRANTY IS THE SOLE WARRANTY MADE BY NEPCCO TO THE CUSTOMER AND IS IN LIEU OF ALL OTHER WARRANTIES OR OBLIGATIONS, EXPRESS OR IMPLIED. NEPCCO EXPRESSLY DISCLAIMS ALL IMPLIED WARRANTIES OR MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.
- (f) THE CUSTOMER AGREES THAT IN NO EVENT SHALL NEPCCO BE LIABLE FOR SPECIAL, INCIDENTAL, INDIRECT, OR CONSEQUENTIAL DAMAGES, INCLUDING BUT NOT LIMITED TO LOSS OF PROFITS, LOSS OF USE, OR ANY OTHER ECONOMIC LOSS, WHETHER BASED ON CONTRACT, TORT OR ANY OTHER LEGAL THEORY. THE REMEDIES PROVIDED HEREIN ARE CUSTOMER'S SOLE AND EXCLUSIVE REMEDIES.

Rev. A-2 11/99

2140 N.E. 36th Avenue, Suite 100 • Ocala, Florida 34470
800-277-3279 • Fax 352-867-1320 • Website: www.nepcco.com

UNLOADING PROCEDURE FOR NEPCCO SKID MOUNTED EQUIPMENT

BEFORE ATTEMPTING TO UNLOAD ANY EQUIPMENT, ENSURE THAT NO DAMAGE HAS OCCURRED DURING SHIPMENT.

FORKLIFT

NOTE: NEPCCO DOES NOT RECOMMEND THAT SYSTEMS OF EXCESSIVE WEIGHT OR SIZE (LARGER THAN 6' X 12') OR CONTAINERIZED SYSTEMS (BUILDINGS) BE UNLOADED WITH A FORKLIFT. FORKLIFT SLOTS ON 8' X 16' AND 10' X 20' SKIDS ARE INTENDED ONLY FOR MOVING THE SKID AT THE NEPCCO FACTORY.

- 1) Verify that all shipping restraints have been removed.**
- 2) Allow forks to enter the fork slots as far as possible.**
- 3) Lift the skid and tilt as necessary to clear trailer bed.**
- 4) Back away from trailer until the unit is clear, then lower the unit for transportation.**
- 5) Set skid into place and withdraw forks from fork slots.**

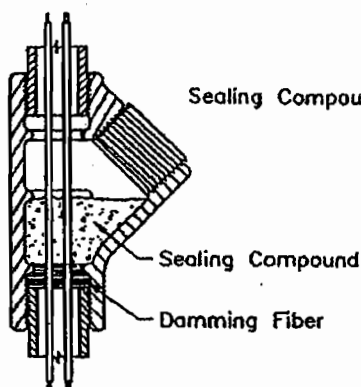
CRANE

- 1) Verify that all shipping restraints have been removed.**
- 2) Containerized units (buildings), as well as many skid mounted systems, require the use of cable spreader bars when unloading with a crane. The distance between the spreader bar eyes should be a minimum of 12'.**

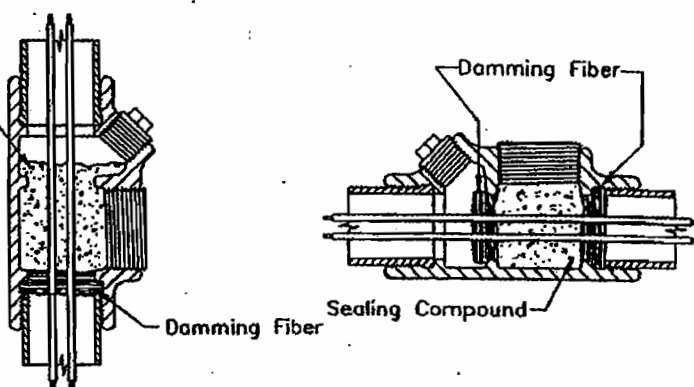
- 3) The cables attaching the spreader bars to the skid lifting eyes should be a minimum of 12', and should be secured at each connection point with a clevis of appropriate rating.
- 4) Connect spreader assembly to crane hook with suitable lifting cables.
- 5) Attach lifting cables to each of the spreader eyes and secure other end of cables to skid pad eyes.
- 6) The skid should be lifted into place in a gentle manner in order to ensure safety and void damage to the equipment.
- 7) When the skid has been set in place, all lifting apparatus should be carefully removed and promptly stored.

Installation Instructions for EY and EYA (M) Sealing Fittings

Type "EY" (Vertical Only)



Type "EYA" (Vertical or Horizontal)



▲ Dam Preparation

Remove plug(s) from fitting. Separate individual conductors* and pack fiber around them into hub of fitting so that compound will surround each conductor but won't leak through. DO NOT USE METAL TOOLS.

* See back for conductor restrictions, to maintain  listing

▲ Compound Preparation

(O-Z/Gedney type "EYC" or Crouse-Hinds type "Chico A" or "Chico A-P" for Chico compound see back for instructions). For EYC follow manufacturer's instructions supplied with sealing compound for preparation of compound before pouring.

▲ Sealing Compound Required

Fitting Size	1/2"	3/4"	1"	1 1/4"	1 1/2"	2"	2 1/2"	3"	3 1/2"	4"	5"	6"
Sealing Compound Required	EY	3/4 oz.	1 3/4 oz.	3 3/4 oz.	6 oz.	9 oz.	15 oz.	---	---	---	---	---
	EYA	3/4 oz.	1 1/2 oz.	2 1/4 oz.	6 oz.	9 oz.	15 oz.	1 lb. 3 oz.	1 lb. 8 oz.	3 lb.	4 lb. 8 oz.	11 lb. 8 oz.
Fiber Required Per Hub	EY	1/32 oz.	1/16 oz.	1/8 oz.	1/4 oz.	1/2 oz.	1 oz.	---	---	---	---	---
	EYA	1/32 oz.	1/16 oz.	1/8 oz.	1/4 oz.	1/2 oz.	1 oz.	1 1/2 oz.	2 oz.	3 oz.	4 1/2 oz.	7 oz.

▲ Pouring Seal

Pour compound into fitting immediately after mixing; fill until compound reaches the lowest edge of the compound filling hole, replace and retighten plug(s).

NOTE: Seals formulated from sealing compound are designed to minimize the passage of gasses and vapors and prevent the passage of flames from one portion of an installation to another through conduit. Seals formulated from compound are not intended to be used at temperature extremes and/or continuous pressure differentials. Highly corrosive vapors and liquids can also affect the ability of seals to perform their intended functions. *Refer to the NEC for additional information.*

MAX NUMBER / SIZE & TYPE OF CONDUCTORS TO BE INSTALLED

SIZE AWG OR MCM	1/2 INCH		3/4 INCH		1 INCH		1-1/4 INCH		1-1/2 INCH		2 INCH		2-1/2 INCH		3 INCH		3-1/2 INCH		4 INCH		5 INCH		6 INCH	
	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B
18	7	11	12	20	20	33	35	58	49	80	80	131	115	187	176									
16	6	9	10	16	17	27	30	47	41	64	68	106	98	151	150									
14	3	8	6	15	10	24	18	43	25	58	41	96	58	137	90		121		155					
12	3	6	5	11	8	18	15	32	21	43	34	71	50	102	76	158	103		132					
10	1	4	4	7	7	11	13	20	17	27	29	45	41	65	64	100	86	134	110	172	173			
8	1	2	2	4	4	6	7	11	9	16	16	26	22	37	35	58	47	78	60	100	94	157	137	
6	1	1	1	2	2	4	4	7	6	9	10	16	15	23	23	35	32	47	41	61	64	96	93	139
4	1	1	1	1	1	2	3	4	5	6	8	9	12	14	18	21	24	29	31	37	49	59	72	85
3			1	1	1	2	3	3	4	5	7	8	10	12	16	18	21	24	28	31	44	50	63	72
2			1	1	1	1	3	3	3	4	6	7	9	10	14	15	19	20	24	26	38	42	55	61
1			1	1	1	1	2	3	3	4	5	7	7	10	11	14	15	18	20	29	31	42	45	
0					1	1	1	2	2	2	4	4	6	6	9	9	12	13	16	16	25	26	37	38
2/0					1	1	1	1	1	2	3	3	5	5	8	8	11	11	14	14	22	22	32	32
3/0					1	1	1	1	1	1	3	3	4	4	7	7	9	9	12	12	19	19	27	27
4/0						1	1	1	1	2	2	3	3	6	6	8	8	10	10	16	16	23	23	
250						1	1	1	1	1	2	3	3	5	5	6	6	8	8	13	13	19	19	
300						1	1	1	1	1	1	3	3	4	4	5	5	7	7	11	11	16	16	
350						1	1	1	1	1	1	1	2	3	3	5	5	6	6	10	10	15	15	
400							1	1	1	1	1	1	2	3	3	4	4	6	6	9	9	13	13	
500								1	1	1	1	1	1	3	3	4	4	5	5	8	8	11	11	
600									1	1	1	1	1	2	3	3	4	4	6	6	9	9		
700									1	1	1	1	1	2	3	3	3	3	6	6	8	8		
750									1	1	1	1	1	1	3	3	3	3	5	5	8	8		
800									1	1	1	1	1	1	2	2	3	3	5	5	7	7		
900									1	1	1	1	1	1	1	2	3	3	4	4	7	7		
1000									1	1	1	1	1	1	1	1	3	3	4	4	6	6		
1250										1	1	1	1	1	1	1	2	3	3	5	5			
1500														1	1	1	1	1	3	3	4	4		
1750															1	1	1	1	1	2	2	4	4	
2000																1	1	1	1	1	1	3	3	
COLUMN A = TYPES RFH-2, RH, RHH, RHW, THW, TW XHHW (AWG 14-6) FEPB (AWG 6-2)																								
COLUMN B = TYPES FEP, THHN, THWN, TFN, PF, PGF XHHW (AWG 4-2000 MCM) FEPB (AWG 14-8)																								

COLUMN A = TYPES RFH-2, RH, RHH, RHW, THW, TW
XHHW (AWG 14-6)
FEPB (AWG 6-2)

COLUMN B = TYPES FEP, THHN, THWN, TFN, PF, PGF
XHHW (AWG 4-2000 MCM)
FEPB (AWG 14-8)

Crouse-Hinds Type 'Chico A' & 'Chico A-P' Compound Preparation Instructions

Mix dry compound before proceeding, to overcome settling. In a clean container, thoroughly mix 2 parts compound to 1 part water by volume. The proper mix should be of a pourable consistency in order to surround each conductor without creating voids.

CAUTION

Sealing compound to be mixed ONLY at temperatures above 40°F/4°C and ONLY poured into fittings that have been brought to a temperature above 40°F/4°C. Seals must NOT be exposed to temperatures below 40°F/4°C for at least 72 hours.

EXPLOSION-PROOF SEAL FITTINGS MUST BE POURED AT THE INSTALLATION SITE

**NEPCCO PROVIDES SEALING COMPOUND WITH ALL EXPLOSION
PROOF SYSTEMS. IF YOU DID NOT RECEIVE YOUR SEALING
PACKAGE, PLEASE CONTACT NEPCCO'S QUALITY ASSURANCE
AT**

1-800-277-3279

DIRECTIONS FOR POURING SEAL FITTINGS

**PACK FITTING HUBS WITH FIBER PACKING. DAMS MUST
COMPLETELY SURROUND CONDUCTORS AND MUST BE FLUSH
WITH CONDUIT HUB HOUSING. FOLLOW THIS 2 TO 1 RATIO
CAREFULLY AS THIS CONSISTENCY WORKS BEST. MIX TWO
PARTS BY VOLUME OF SEALING COMPOUND TO ONE PART OF
CLEAN COLD WATER. WARM WATER WILL DECREASE THE
SETTING TIME AND COMPOUND MAY HARDEN TOO QUICKLY.
DO NOT MIX MORE COMPOUND THAN CAN BE POURED IN 15
MINUTES. POUR SEAL FITTINGS TO CAPACITY AND REPLACE
CAPS.**

CAUTION:

**THIS PROCEDURE SHOULD BE DONE BY ADEQUATELY TRAINED
PERSONNEL IN STRICT COMPLIANCE WITH LOCAL AND NEC
CODES.**

START-UP PROCEDURES

1

ENGINEERING DRAWINGS

COMPONENT LIST

SVE BLOWER

2

MISC. SYSTEM COMPONENTS

3

MAINTENANCE

4

START UP PROCEDURES
ENGINEERING DRAWINGS
COMPONENTS LISTS

INSTALLATION & START UP PROCEDURES

NEPCCO #10880

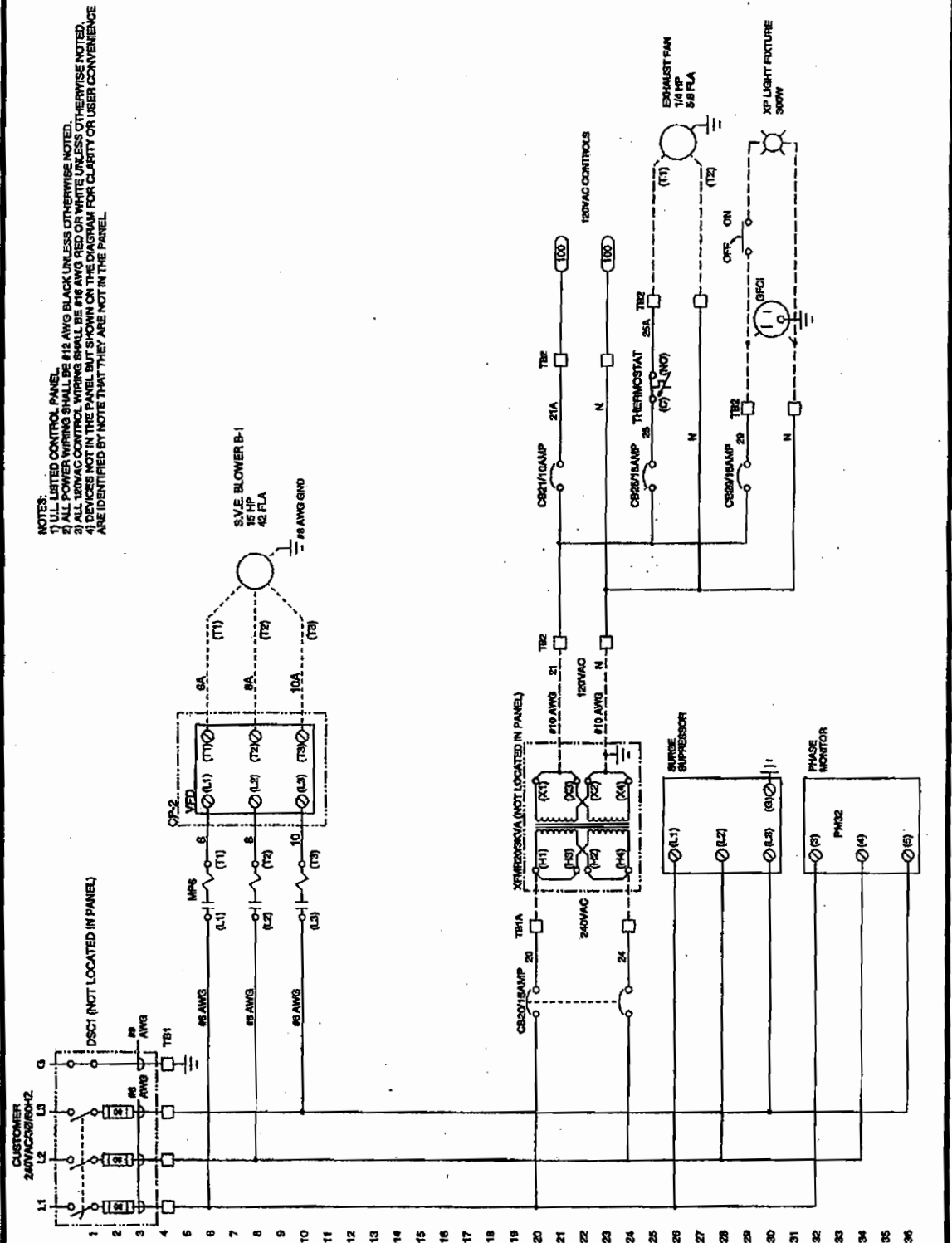
- 1) Read the entire manual before operating this system. The manual contains specific information about the equipment on this system.
- 2) Install trailer on a level concrete pad. Anchor straps are recommended to secure trailer to the pad.
- 3) Connect the field piping to system piping as per process and instrumentation diagram numbered 10880-2-01.
- 4) Ensure all valves are open/closed per process and instrumentation diagram numbered 10880-2-01, and close all petcocks and sample ports.
- 5) All electrical work should be performed by a qualified electrician in accordance with the latest edition of the National Electric Code, local codes and regulations. Short circuit protection should be provided according to the total load summary of the system. This system requires 230 VAC three phase power with ground. Refer to the electrical wiring diagrams in this manual for electrical integration.
- 6) Turn all control panel switches to the "OFF" position and ensure that the main power disconnect (supplied by others on site) is in the "OFF" position.
- 7) Place the circuit breakers in the "ON" position and depress the "START" button on the motor protector, then close the front panel.
- 8) Turn on power at the main power disconnect.
- 9) Turn the switch labeled "SVE BLOWER B-1" to the "AUTO" position.
- 10) When the blower reaches operating speed, adjust "GV-1" as required to achieve optimum blower performance. Refer to the blower performance curve in this manual.
- 11) This system is equipped with fault/alarm sensors which will shut down the blower in the event of a high liquid level in the air/water separator. If an alarm condition is experienced, correct the cause and press the fault/alarm reset button. The unit will resume normal operation.
- 12) Monitor the system and check operating parameters for satisfactory performance.
- 13) Routine maintenance is essential for proper system operation and should be performed on a regular basis. Sample maintenance forms are included in section 4 of the system manual.
- 14) The system manual includes individual equipment and component specifications and adjustment procedures necessary for initial start up and regular maintenance.

- 15) If there are any problems with or questions about your system, we will be glad to help you resolve them. Please call our toll free number 1-800-277-3279.

1-800-277-EASY

DATE	BY	REV
04/04/01	QA	ASBUILT
02/28/01	DSH	B-1 TO 15HP
11/15/01	DSH	ADD VFD

NEPCCO
2140 N. E. 38TH AVE SUITE 100 OCALA, FL 34470
PREPARED FOR: METCALF & EDDY
PROJECT NAME: NU-LOOK CLEANERS
CUSTOMER NO.:
TITLE: ELECTRICAL LADDER
DRAWN BY: DSH
ENGINEERING:
MFGE:
QC:
DATE: 2/7/01
DWG NO: 10890-S-01
SCALE:
SHEET OF



DATE | BY | REV

04/04/01 QA AS BUILT
11/15/01 DSH 139 TO 157
04/17/02 DSH VFD PIN 11

NEPCCO

2140 N. E. 36TH AVE
SUITE 100
OCALA, FL 34470PREPARED FOR:
METCALF & EDDYPROJECT NAME:
IN-LOOK CLEANERS

CUSTOMER NO.:

TITLE:
ELECTRICAL LADDER

DRAWN BY: DSH

ENGINEERING:

MFG:

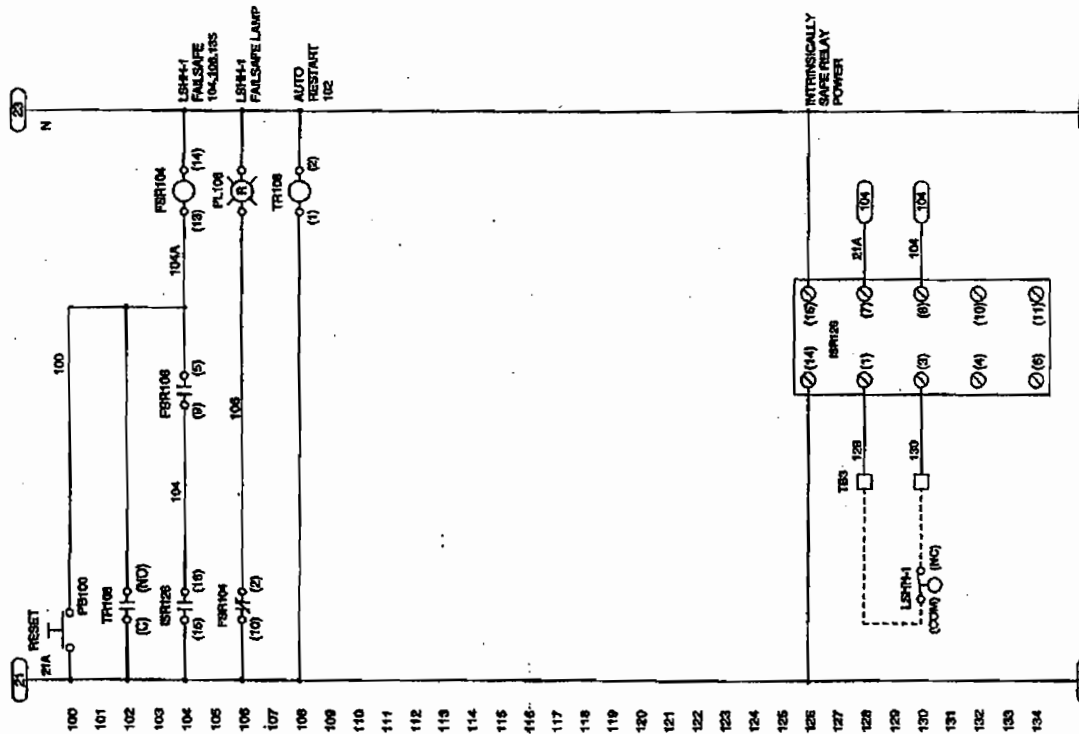
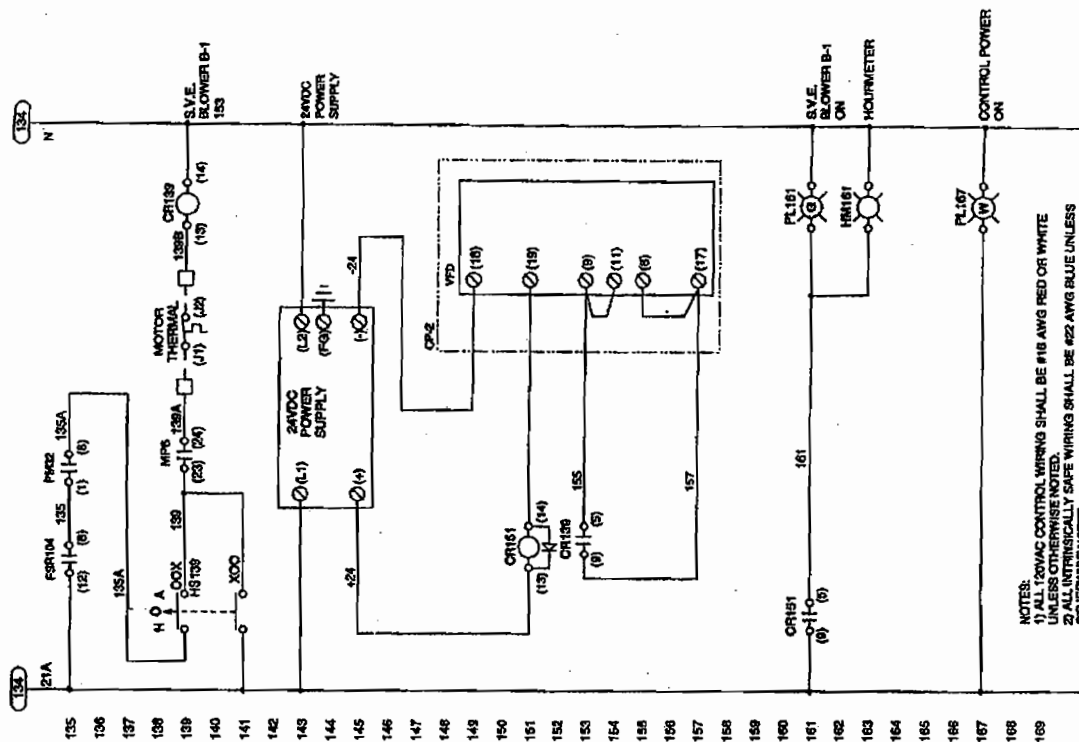
QC:

DATE: 2/7/01

DWG NO: 10880-5-02

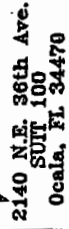
SCALE:

SHEET OF



NOTES:
1) ALL 120VAC CONTROL WIRING SHALL BE #18 AWG RED OR WHITE
UNLESS OTHERWISE NOTED.
2) ALL INTRINSICALLY SAFE WIRING SHALL BE #22 AWG BLUE UNLESS
OTHERWISE NOTED.

02/12/01 EF REV-1
02/26/01 EF REV-2
04/04/01 QA AS BUILT



PREPARED FOR:
METCALF & EDDY

NU-LOOK CLEANERS

P. & M.

ENGINEERING: EF

30

DWG NO:10880-2--01

SHEET:



3. SYSTEM REVISED BY M+E
TO INCLUDE 3 INFLUENT
LINES.

DATE BY REV

02/12/01 EF REV-1
02/28/01 EF REV-2
04/04/01 AS BUILT



2140 N.E. 36th Ave.
SUITE 100
Ocala, FL 34470

PREPARED FOR:
METCALF & EDDY

PROJECT NAME:

NU-LOOK
CLEANERS

TITLE:

LAYOUT

DRAWN BY: MLB

ENGINEERING: EF

MFG:

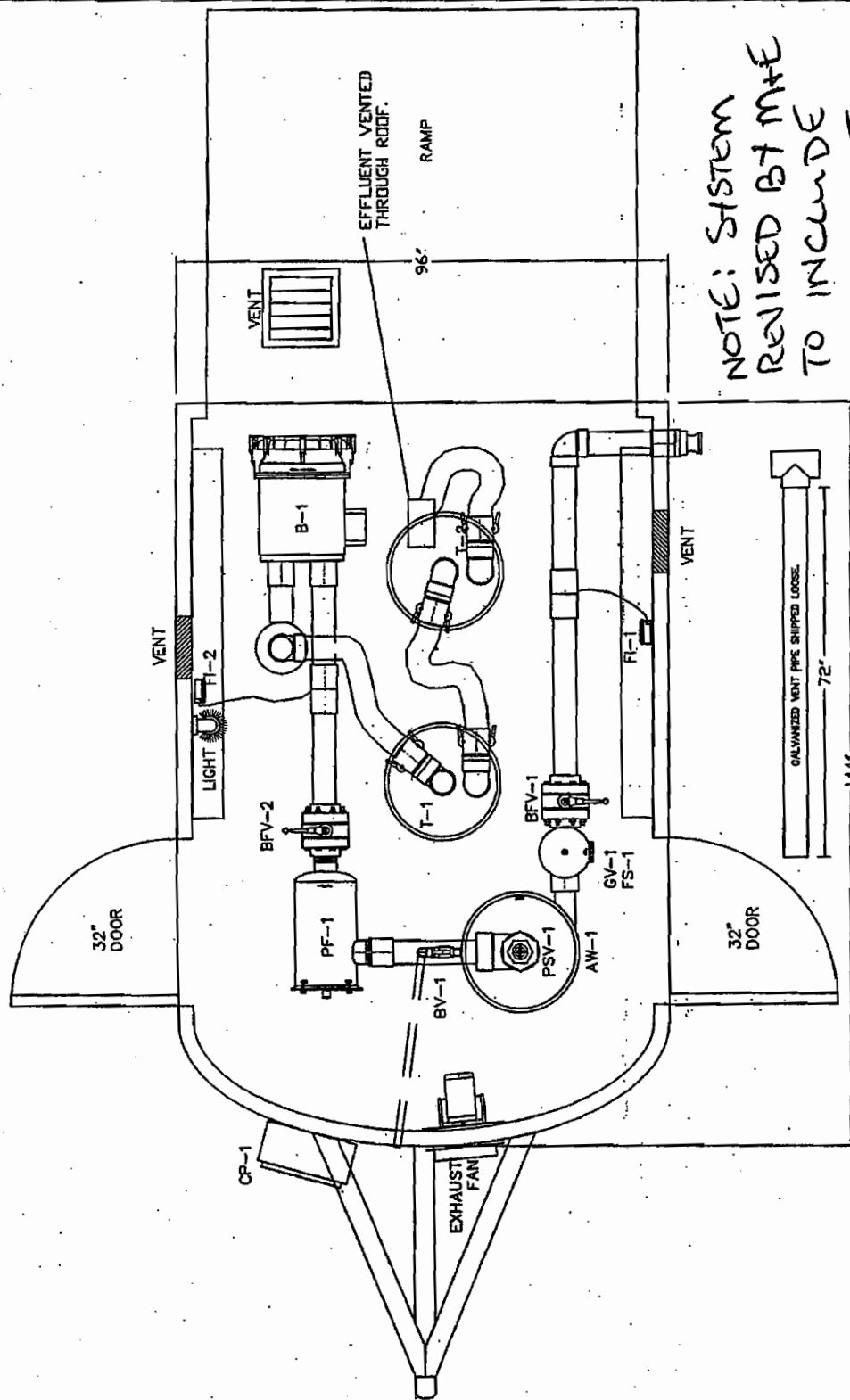
QC:

DATE: 02/02/01

DWG NO: 10880-3-01

SCALE: NTS

SHEET:



NOTE: SYSTEM
REVISED BY MFE
TO INCLUDE
3 INFLUENT
LINES.

144"
72"
GALVANIZED VENT PIPE SHIPPED LOOSE.

COMPONENT LIST

THE FOLLOWING ITEMS ARE REQUIRED FOR PROJECT # 10380

CLIENT NAME:

PROJECT NAME:

LINE NO.	P&ID	DESCRIPTION AND SPECIFICATIONS	NEPCCO/MANUFACTURER	SERIAL
NO. REQ.	LABEL		PART NUMBER	NUMBER
- CONTROLS				
1	1	DSC1 SAFETY SWITCH, 60 AMP, 240 VAC, 3 PHASE, NEMA 3R W/	D322NRB	
2	6	FU1A,B,C 60 AMP, CLASS J, TIME DELAY FUSES		
3	1	BOX OUTLET "BELL BOX NEMA 4"	3-002	
4	1	GFCI RECEPTACLE	3-001	
5	1	LOCKABLE GFCI COVER	3-01	50280
6	1	FP-2 CONCEPT ENCLOSURE, 36" X 36" X 12"	C-SD363612	
7	1	FP-2 NEMA PANEL FOR 36" X 36" ENCLOSURE	A-36P36	
8	1	FP-1 CONCEPT ENCLOSURE, 24" X 20" X 8"	C-SD24208	
9	1	FP-1 CONCEPT PANEL FOR 24" X 20" ENCLOSURE	C-P2420	
10	1	FP-1 NEMA PANEL FOR 24" X 20" ENCLOSURE	A-24P20	
11	1	FP-1 SWING-OUT PANEL KIT, C-SPM2	C-SPM2	
12	2	FP-1, FP-2 PADLOCKING WING-KNOB HANDLE, C-WHPTO	C-WHPTO	
13	1	TB1 CLASS 9080 POWER DISTRIBUTION BLOCK, 3 POLE (1) #6-400 (6) #14-2	LBA363106	
14	1	CB21 FEED THROUGH CIRCUIT BREAKER, 1 POLE 10 AMP	QOU110	
15	2	CB25,29 FEED THROUGH CIRCUIT BREAKER, 1 POLE 15 AMP	QOU115	
16	1	CB20 FEED THROUGH CIRCUIT BREAKER, 2 POLE 15 AMP	QOU215	
17	1	FEED THROUGH CIRCUIT BREAKER, 3 POLE 60 AMP	QOU360	
18	1	XFMR20 TRANSFORMER, 240/480 x 120/240 VAC, 3 KVA, INDOOR/OUTDOOR	7400-3S1F	
19	1	SURGE SUPPRESSOR, 120/240/120VAC, HIGH LEG DELTA	3XC88	
20	1	PM32 SSAC PHASE MONITOR, REQUIRES OCTAL BASE	PLMU11	
21	1	PM32 OCTAL 8 PIN BASE FOR SSAC	NDS-8	
22	2	GENERAL PURPOSE RELAY, 1 POLE (24 VDC) IDEC	RH1B-U-24DC	
23	2	GENERAL PURPOSE RELAY BASE, 1 POLE IDEC	SH1B-05	
24	1	FSR104 GENERAL PURPOSE RELAY, 4 POLE (120 VAC) IDEC	RH4B-U-120AC	
25	1	FSR104 GENERAL PURPOSE RELAY BASE, 4 POLE IDEC	SH4B-05	
26	1	ISR126 INTRINSICALLY SAFE TRANSFORMER ISOLATED BARRIER (2 CHANNEL)	KFA5-SR2-EX2.W	
27	1	TR108 SSAC COMPACT INTERVAL TIMER, SPST, 1 TO 100 SEC, 120 VAC	KRDI421	
28	1	HM161 HOURMETER, PANEL MOUNT, 3 HOLE ROUND, 120 VAC, NEMA 4X	1672T11	
29	1	PB100 PUSHBUTTON, MOMENTARY, FLUSH CAP, RED, W/N.C. & N.O. CONTACTS	800H-AR6B	
30	1	HS139 SELECTOR SWITCH, 3 POSITION, SPRING RET. LEFT TO CENTER	SROLC-SHWE-NO/NO	
31	1	PL161 PILOT LIGHT, 120 VAC, GREEN	FVLU120-PLLGN	
32	1	PL106 PILOT LIGHT, 120 VAC, RED (LAMP #755)	800H-PR16R	
33	1	PL167 PILOT LIGHT, 120 VAC, CLEAR	FVLU120-PLLCR	
34	1	LEGEND PLATE TALL, 30 MM, RED/WHITE, "RESET"	LPTRD-18	
35	1	LEGEND PLATE TALL, 30 MM, BLACK/WHITE, "ON"	LPTBK-13	
36	1	LEGEND PLATE TALL, 30 MM, RED/WHITE, SPECIAL LINE 1 "FAULT ALARM" LINE 2 "AWS HIGH LEVEL" LINE 3 "LSHH-1"	LPTSP-RD	
37	1	LEGEND PLATE TALL, 30 MM, BLACK/WHITE, SPECIAL LINE 1 "SVE BLOWER B-1" LINE 2 "HAND OFF AUTO" LINE 3 "	LPTSP-BK	
38	1	LEGEND PLATE TALL, 30 MM, BLACK/WHITE, SPECIAL	LPTSP-BK	

- MOTOR STARTERS			
39	1	MC139 IEC CONTACTOR, 15 HP, 240 VAC, 3Ø, 120 VAC COIL, N.O. AUX. (MAX AMPS 50)	LC1D5011G6
40	1	MP6 MOTOR PROTECTOR, 10 HP, 240 VAC, 3Ø, 25-40 AMP	GV3-M40
41	1	MP6 MOTOR PROT. SIDE MOUNT AUX. CONTACT BLOCK, 2 N.O. CONTACTS (GV-3)	GV1-A02
	1	VFD VARIABLE FREQUENCY DRIVE, 230VAC, 3 PHASE, 15HP	ID15H215-E
- SENSORS			
42	1	LSHH-1 LIQUID LEVEL SWITCH, XP	3-Ø L6-EPB-B-S-3-A
- FLOWMETERS AND TOTALIZERS			
43	4	FI-2 ROTRON 3" DIRECT READING FLOW METER ⁰⁻²⁵⁰ 0-175 SCFM (HORIZONTAL MOUNT)	550607
44	1	FI-1 DWYER PITOT TUBE DS-300 4" MAINT PIPE SIZE	DS300-1
		DWYER SQUARE ROOT SCALE DIRECT READING 60FPM	
45	1	FI-1 METER CAPACUVELIC (BRASS), 75 DEGREES F, FOR DS-300 4" PITOT TUBE, SEE BLOWER CURVE	4401-B
- VALVES			
46	2	BFV-1, 2 BUTTERFLY VALVE, 4", STEEL	NONE
47	1	GV-1 GATE VALVE, 2", BRASS, KITZ CODE 07	3-Ø 07-200
48	1	BV-1 HALF UNION BALL VALVE, 1", SCH80 PVC, GEORGE FISHER	3-Ø 161.354.344
49	4	SP 1/4" SAMPLE PORT	3-001
- CAMLOCKS			
50	1	CAM LOCK, 4", TYPE A, FPT x MALE CAMLOCK, ALUMINUM	1323-040
51	4	CAM LOCK, 4", TYPE C, HOSE BARB x FEMALE CAMLOCK, ALUMINUM	1327-040
52	4	CAM LOCK, 4", TYPE F, MPT x MALE CAMLOCK, ALUMINUM	1322-040
53	2	4" HOSE BARB X MALE PIPE THREAD	
- GAUGES			
54	3	PI-1 TO 3 PRESSURE INDICATOR, 0-100" H2O VACUUM, BACKMOUNT	1-Ø P343V
55	3	PI-4, TO 6 PRESSURE INDICATOR, 0-55" H2O, BACKMOUNT	P342
56	2	TI-1, 2 TEMPERATURE INDICATOR, 0-250 °F, 2-1/2" STEM, 1/2" NPT	1-Ø 30025-B8
- BUILDINGS			
57	1	APPLETON XP LIGHT SWITCH	EFSC150-F1
58	1	XP LIGHT FIXTURE, 300 WATTS, 120VAC, 150 WATT BULB	AASB75/AAU15N
59	1	XP EXHAUST FAN, 12" BLADE, 115 VOLTS, 645 CFM, MOUNTS INSIDE BUILDING	4C020
60	1	SHUTTER FOR ABOVE XP EXHAUST FAN, 12"	2C518
61	1	THERMOSTAT FOR ABOVE, NEMA 1, 30-100 °F	4EO47
- NONSTANDARD ITEMS			
62	9	BOX (4 SHEETS - 27" X 54") ACOUSTICAL CONVOLUTED FOAM, 1" THICK	5T492
- SVE's			
63	1	B-1 ROTRON BLOWER, EN909BG72WL, 15HP	EN909
- AIR WATER SEPARATORS			
64	1	AW-1 MOISTURE SEPERATOR, 40 GAL., 600 CFM MAX., 22" HG MAX VACUUM, 6" WATER MAX PRESSURE DROP, 23" DIA., METAL BODY, WITH VACUUM RELIEF VALVE (NO LEVEL SWITCH, WITH DRAIN)	MS600B
- AIR FILTERS			
65	1	FS-1 INLET PARTICLE FILTER/SILENCER, 2"	FS-31P-200
66	1	PF-1 IN-LINE AIR PARTICLE FILTER, 4", WITH 10 MICRON FILTER	CSL-235P-400
67	1	SILENCE R IN-LINE MUFFLER / SILENCER, STEEL HOUSING, 4" DIAMETER	516264

Nepcco Systems

P + ID INFORMATION

2/12/01
P&ID INFO.xls

PREPARED FOR: METCALF & EDDY
PROJECT NAME: NU-LOOK CLEANERS
JOB NUMBER: 10880

EQUIPMENT INFORMATION

ID LABEL	DESCRIPTION	SIZE	TYPE
AW-1	AIR/WATER SEPARATOR	MS600B	ROTRON
B-1	REGENERATIVE BLOWER	EN909BG72WL	ROTRON
FI-1, 2	PITOT TUBE WITH MAGNEHELIC	DS-300-4	DWYER
FS-1	INLET FILTER/SILENCER	FS-31P-200	SOLBERG
LSHH-1	LEVEL SWITCH, HIGH-HIGH	L6-EPB-B-S-3-A	DWYER
PF-1	IN-LINE PARTICLE FILTER	CSL-235P-400	SOLBERG
PI-1, 2, 3	PRESSURE INDICATOR (VACUUM)	0-100" WATER	
PI-4, 5, 6	PRESSURE INDICATOR	0-55" WATER	
T-1, 2	VAPOR PHASE CARBON	VR140	
TI-1, 2	TEMPERATURE INDICATOR	0-250 DEG. F	

VALVE INFORMATION

BFV-XX	BUTTERFLY VALVE
BV-XX	BALL VALVE
CV-XX	CHECK VALVE
GV-XX	GATE VALVE
PSV-XX	PRESSURE SAFETY VALVE
SV-XX	SOLWNOID VALVE

CONTROL LOGIC

Project No: 10880
Project Name: Metcalf & Eddy / Nu-Look Cleaners
Date: 2/7/01
Drawing No.: 10880-6-01

Created by: DSH
Engineering: _____
Manufacturing: _____
Quality Control: _____

Operators & Indicators

Operational Description

S.V.E. blower B-1 switch "OFF" Turns off S.V.E. blower B-1.

S.V.E. blower B-1 switch "AUTO" S.V.E. blower B-1 will run unless AW-1 water level reaches LSHH-1.

S.V.E. blower B-1 switch "HAND" Turns on S.V.E. blower B-1. Blower will run continuously independent of failsafe condition shutdowns.

S.V.E. blower B-1 "ON" lamp (green) On when S.V.E. blower B-1 is on.

"CONTROL POWER ON" lamp (clear) On when 120VAC control power is on.

Failsafes

Operational Description

Level switch high-high #1 "LSHH-1" Turns on "LSHH-1" Failsafe lamp. Shuts down S.V.E. blower B-1 until manually reset.

Failsafe lamp (red) "LSHH-1" On when a "LSHH-1" failsafe condition exists:

Pushbutton "RESET" Resets all failsafes.

Electrical Load Summary

Project Name: Metcalf & Eddy / Nu-Look Cleaners
Project Number: 10880
System Voltage/Phase: 240/3
Drawing Number: 10880-7-01
Date: 2/7/01

Created By:	DSH
Engineering:	
Manufacturing:	
Quality Control:	
Rev Date:	6/28/01

[illegible]

NOTE: This document is to be used only for calculating feeder short circuit protection and sizing motor feeder circuit conductors as needed. Individual motor overload protection must be sized according to motor nameplate only.

Project No. 10880

[illegible]

CONTROL CONCEPTS SPECIAL LABELS

JOB #10880

FAULT ALARMS

RED WITH WHITE LETTERS

LPT-SP-RD

Line 1:	FAULT	ALARM							
Line 2:									
Line 3:									

Identify item faulting
Identify alarm

Line 1:	FAULT	ALARM							
Line 2:									
Line 3:									

Identify item faulting
Identify alarm

Line 1:	FAULT	ALARM							
Line 2:									
Line 3:									

Identify item faulting
Identify alarm

Line 1:	FAULT	ALARM							
Line 2:									
Line 3:									

Identify item faulting
Identify alarm

Line 1:	FAULT	ALARM							
Line 2:									
Line 3:									

Identify item faulting
Identify alarm

Line 1:	FAULT	ALARM							
Line 2:									
Line 3:									

Identify item faulting
Identify alarm

Line 1:	FAULT	ALARM							
Line 2:									
Line 3:									

Identify item faulting
Identify alarm

Line 1:	FAULT	ALARM							
Line 2:									
Line 3:									

Identify item faulting
Identify alarm

SWITCHES

BLACK WITH WHITE LETTERS

LPT-SP-BK

Line 1:	CONTROL	POWER	ON						
Line 2:									
Line 3:									

Identify switch
(Leave blank)

Line 1:	HAND	OFF	AUTO						
Line 2:									
Line 3:									

Identify switch
(Leave blank)

Line 1:	HAND	OFF	AUTO						
Line 2:									
Line 3:									

Identify switch
(Leave blank)

Line 1:	HAND	OFF	AUTO						
Line 2:									
Line 3:									

Identify switch
(Leave blank)

Line 1:	HAND	OFF	AUTO						
Line 2:									
Line 3:									

Identify switch
(Leave blank)

Line 1:	OFF	ON							
Line 2:									
Line 3:									

Identify switch
(Leave blank)

Line 1:	OFF	ON							
Line 2:									
Line 3:									

Identify switch
(Leave blank)

Line 1:	OFF	ON							
Line 2:									
Line 3:									

Identify switch
(Leave blank)

SVE

GENERAL INSTALLATION INSTRUCTIONS

AMETEK

ROTRON TECHNICAL MOTOR DIVISION

Industrial Products

75 North Street, Saugerties, NY 12477 U.S.A.

Telephone: 914-248-3401 Fax: 914-248-3802

Rotron Regenerative Blowers

Installation Instructions for SL, DR, EN, CP, and HiE Series Blowers

1. **Bolt It Down** - Any blower must be secured against movement prior to starting or testing to prevent injury or damage. The blower does not vibrate much more than a standard electric motor.
2. **Filtration** - All blowers should be filtered prior to starting. Care must be taken so that no foreign material enters the blower. If foreign material does enter the blower, it could cause internal damage or may exit at extremely high velocity.

Should excessive amounts of material pass through the blower, it is suggested that the cover(s) and impeller(s) be removed periodically and cleaned to avoid impeller imbalance. Impeller imbalance greatly speeds bearing wear, thus reducing blower life. Disassembling the blower will void warranty, so contact the factory for cleaning authorization.

3. **Support the Piping** - The blower flanges and nozzles are designed as connection points only and are not designed to be support members.

*Caution: Plastic piping should not be used on blowers larger than 1 HP that are operating near their maximum pressure or suction point. Blower housing and nearby piping temperatures can exceed 200°F. Access by personnel to the blower or nearby piping should be limited, guarded, or marked, to prevent danger of burns.

4. **Wiring** - Blowers must be wired and protected/fused in accordance with local and national electrical codes. All blowers must be grounded to prevent electrical shock. Slo-Blo or time delay fuses should be used to bypass the first second of start-up amperage.
5. **Pressure/Suction Maximums** - The maximum pressure and/or suction listed on the model label should not be exceeded. This can be monitored by means of a pressure or suction gage (available from Rotron), installed in the piping at the blower outlet or inlet. Also, if problems do arise, the Rotron Field representative will need to know the operating pressure/suction to properly diagnose the problem.
6. **Excess Air** - Bleed excess air off. DO NOT throttle to reduce flow. When bleeding off excess air, the blower draws less power and runs cooler.

Note: Remote Drive (Motorless) Blowers - Properly designed and installed guards should be used on all belts, pulleys, couplings, etc. Observe maximum remote drive speed allowable. Due to the range of uses, drive guards are the responsibility of the customer or user. Belts should be tensioned using belt gauge.

For further information regarding Rotron regenerative blowers (including service & parts manuals), please contact your local field sales engineer.

Maintenance Procedure

When properly piped, filtered, and applied, little or no routine maintenance is required. Keep the filter clean. Also, all standard models in the DR, EN, CP, and HiE series have sealed bearings that require no maintenance. Bearing should be changed after 15,000 to 20,000 hours, on average. Replacement bearing information is specified on the chart below.

Bearing Part Number	Size	Seal Material	Grease	Heat Stabilized
510217 510218 510219	205 206 207	Polyacrylic	Nye Rheotemp 500 30% +/- 5% Fill	Yes - 325 F
510449 516440 516648	203 202 307	Buna N	Shell-Dolium "R" 25-40% Fill	NO
516840 516841 516842 516843 516844 516845 516846 516847	206 207 208 210 309 310 311 313	Buna N	Shell Dolium "R" 30% +/- 5% Fill	NO

Troubleshooting

		POSSIBLE CAUSE	OUT OF WARRANTY REMEDY ***
IMPELLER DOES NOT TURN	Humming Sound	1. * One phase of power line not connected 2. * One phase of stator winding open 3. Bearings defective 4. Impeller jammed by foreign material 5. Impeller jammed against housing or cover 6. ** Capacitor open	1. Connect 2. Rewind or buy new motor 3. Change bearings 4. Clean and add filter 5. Adjust 6. Change capacitor
	No Sound	1. * Two phases of power line not connected 2. * Two phases of stator winding open	1. Connect 2. Rewind or buy new motor
IMPELLER TURNS	Blown Fuse	1. Insufficient fuse capacity 2. Short circuit	1. Use time delay fuse of proper rating 2. Repair
	Motor Overheated Or Protector Trips	1. High or low voltage 2. * Operating in single phase condition 3. Bearings defective 4. Impeller rubbing against housing or cover 5. Impeller or air passage clogged by foreign material 6. Unit operating beyond performance range 7. Capacitor shorted 8. * One phase of stator winding short circuited	1. Check input voltage 2. Check connections 3. Check bearings 4. Adjust 5. Clean and add filter 6. Reduce system pressure/vacuum 7. Change capacitor 8. Rewind or buy new motor
	Abnormal Sound	1. Impeller rubbing against housing or cover 2. Impeller or air passages clogged by foreign material 3. Bearings defective	1. Adjust 2. Clean and add filter 3. Change bearings
	Performance Below Standard	1. Leak in piping 2. Piping and air passages clogged 3. Impeller rotation reversed 4. Leak in blower 5. Low voltage	1. Tighten 2. Clean 3. Check wiring 4. Tighten cover, flange 5. Check input voltage

* 3 phase units

** 1 phase units

*** Disassembly and repair of new blowers or motors will void the Rotron warranty. Factory should be contacted prior to any attempt to field repair an in-warranty unit.



ROTRON TECHNICAL MOTOR DIVISION
REGENERATIVE BLOWER GROUP

75 North Street
Saugerties, New York 12477
Phone: (914) 246-3401 845
Fax: (914) 246-3802

EXPLOSION-PROOF BLOWERS



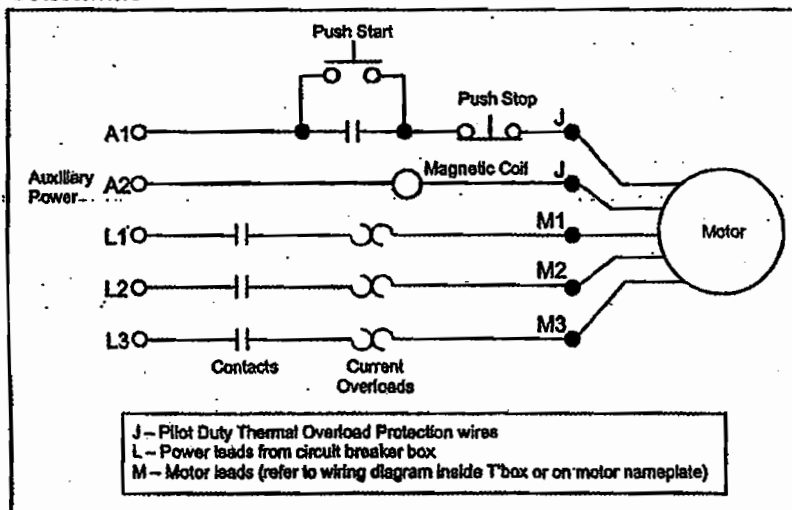
IMPORTANT: Read before wiring this Explosion-proof Blower

This AMETEK Rotron Explosion-proof Regenerative Blower may be equipped with Pilot Duty Thermal Overload (PDTO) or Automatic Thermal Overload (ATO) protection. When properly wired to a motor starter, this protection limits the motor winding temperature rise per the National Electric Code (NEC) article 500. Failure to properly wire this blower is an NEC violation and could cause an explosion. AMETEK Rotron assumes no responsibilities for damages incurred by negligent use of this product, and will not warranty a blower on which the PDTO is not properly connected. Some blowers 1 HP and under do not require PDTO and have built in ATO. Consult the factory if verification of wiring connections is required.

In all cases, follow the motor controller manufacturer's instructions. The following schematic is for conceptual understanding only, and may not apply to all motor/controller combinations.

The manufacturer's wiring diagram found on the motor takes precedent over reference diagrams supplied by AMETEK Rotron Technical Motor Division.

Schematic



The schematic is shown for a three phase motor. For a single phase motor disregard L3 and M3. Pushing the START button completes the auxiliary control circuit, allowing current to flow through the magnetic coil. The contacts are magnetically closed, starting the motor and latching the auxiliary circuit. The motor will continue to run until the STOP push button is depressed, the motor reaches the overload temperature, or the current sensing overloads trip out.

If you have any questions, contact AMETEK Rotron at 914-246-3401 for the location of your area representative.

POLICY REGARDING INSTALLATION OF AMETEK ROTRON REGENERATIVE BLOWERS IN HAZARDOUS LOCATIONS

AMETEK Rotron will not knowingly specify, design or build any regenerative blower for installation in a hazardous, explosive location without the proper NEMA motor enclosure. AMETEK Rotron does not recognize sealed blowers as a substitute for explosion-proof motors. Sealed units with standard TEFC motors should never be utilized where local, state, and/or federal codes specify the use of explosion-proof equipment.

AMETEK Rotron has a complete line of regenerative blowers with explosion-proof motors. Division 1 & 2, Class I, Group D; Class II, Groups F & G requirements are met with these standard explosion-proof blowers.

AMETEK Rotron will not knowingly specify, design or build any regenerative blower for installation in a hazardous, corrosive environment without the proper surface treatment and sealing options.

AMETEK Rotron has a complete line of Chemical Processing and Nasty Gas™ regenerative blowers with Chem-Tough™, stainless steel parts, and seals.

AMETEK Rotron offers general application guidance; however, suitability of the particular blower selection is ultimately the responsibility of the purchaser, not the manufacturer of the blower.

FS2 Rev. B 3/10/98

EN 909 & CP 909

Sealed Regenerative Blower w/ Explosion-Proof Motor

FEATURES

- Manufactured in the USA – ISO 9001 compliant
- Maximum flow: 600 SCFM
- Maximum pressure: 120 IWG
- Maximum vacuum: 100 IWG
- Standard motor: 15 HP, explosion-proof
- Cast aluminum blower housing, cover, impeller & manifold; cast iron flanges (threaded); teflon lip seal
- UL & CSA approved motor with permanently sealed ball bearings for explosive gas atmospheres Class I Group D minimum
- Sealed blower assembly
- Quiet operation within OSHA standards

MOTOR OPTIONS

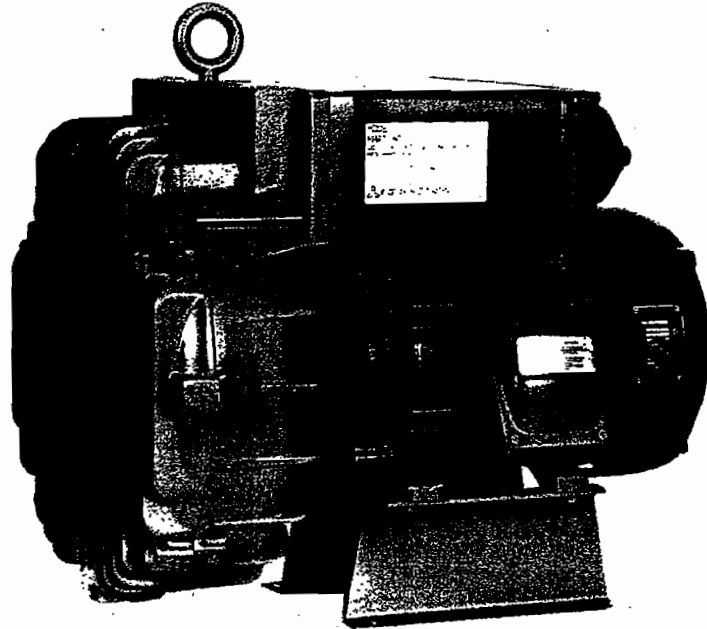
- International voltage & frequency (Hz)
- Chemical duty, high efficiency, inverter duty or industry-specific designs
- Various horsepower for application-specific needs

BLOWER OPTIONS

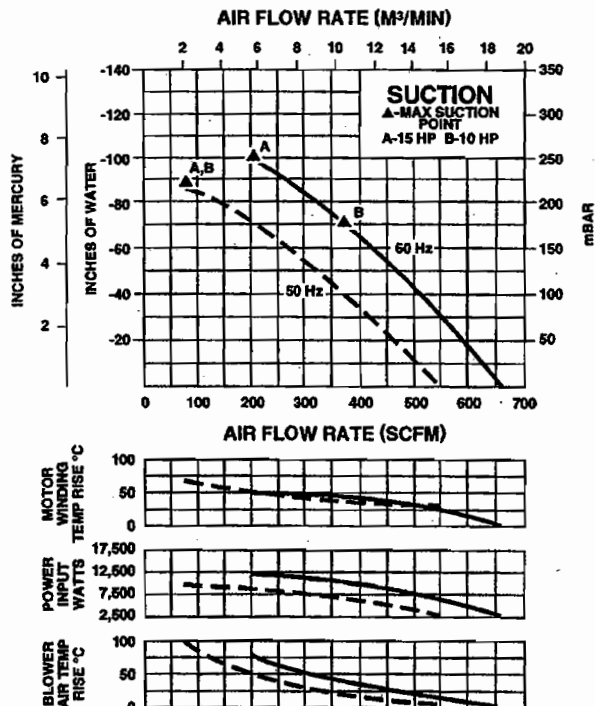
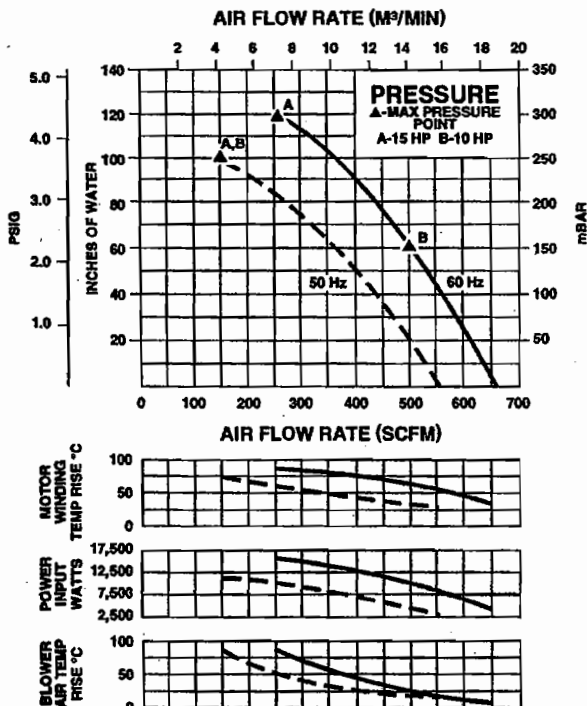
- Corrosion resistant surface treatments & sealing options
- Remote drive (motorless) models
- Slip-on or face flanges for application-specific needs

ACCESSORIES (See Catalog Accessory Section)

- Flowmeters reading in SCFM
- Filters & moisture separators
- Pressure gauges, vacuum gauges & relief valves
- Switches – air flow, pressure, vacuum or temperature
- External mufflers for additional silencing
- Air knives (used on blow-off applications)
- Variable frequency drive package



BLOWER PERFORMANCE AT STANDARD CONDITIONS

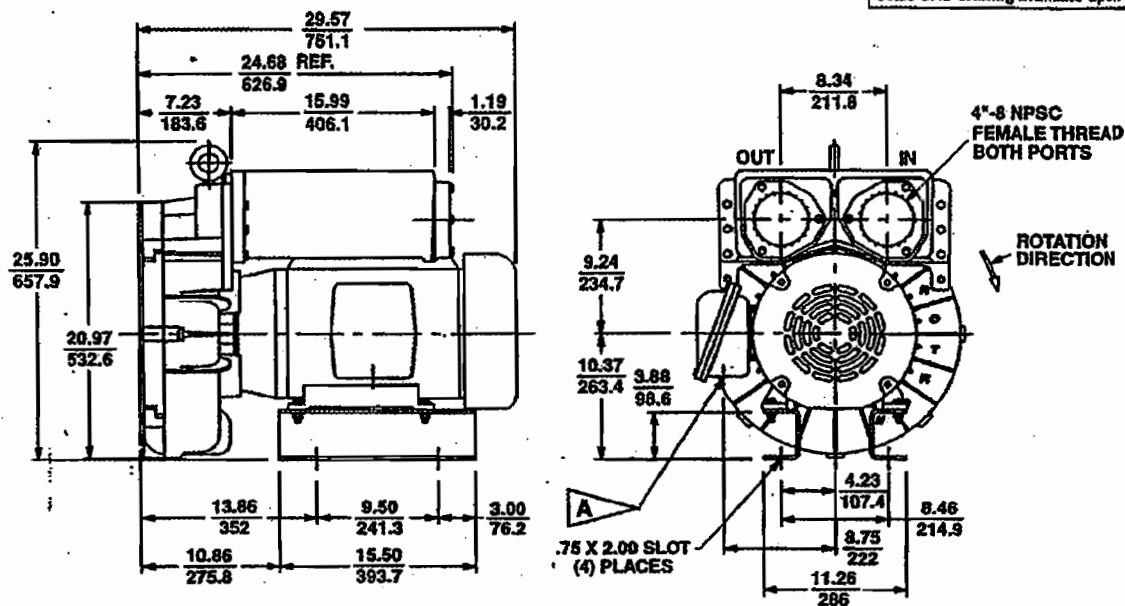


Rev. 2/01

EN 909 & CP 909

Explosion-Proof Regenerative Blower

Scale CAD drawing available upon request.



DIMENSIONS: IN
MM
TOLERANCES: .XX ± $\frac{1}{25}$
(UNLESS OTHERWISE NOTED)

A 1.25" NPT CONDUIT CONNECTION AT 6 O'CLOCK POSITION

SPECIFICATIONS

MODEL	EN909BG72WL	EN909BG86WL	EN909BD72WL	CP909GA72WLR
Part No.	038629	038634	080071	038982
Motor Enclosure -- Shaft Material	Explosion-proof -- CS	Explosion-proof -- CS	Explosion-proof -- CS	Chem XP -- SS
Horsepower	15	15	10	Same as EN909BG72WL -- 038629 --except add Chemical Processing (CP) features --from catalog inside front cover
Phase - Frequency ¹	Three - 60 Hz	Three - 60 Hz	Three - 60 Hz	
Voltage ¹	230 460	575	230 460	
Motor Nameplate Amps	36 18	14.4	22.2 11.1	
Max. Blower Amps ³	44 22	18	26 13	
Inrush Amps	240 120	100	162 81	
Starter Size	2 2	2	2 1	
Service Factor	1.0	1.0	1.0	
Thermal Protection ²	Class B - Pilot Duty	Class B - Pilot Duty	Class B - Pilot Duty	
XP Motor Class -- Group	I-D, II-F&G	I-D, II-F&G	I-D, II-F&G	
Shipping Weight	584 lb (265 kg)	584 lb (265 kg)	564 lb (256 kg)	

¹ Rotron motors are designed to handle a broad range of world voltages and power supply variations. Our dual voltage 3 phase motors are factory tested and certified to operate on both: 208-230/415-460 VAC-3 ph-60 Hz and 180-208/380-415 VAC-3 ph-50 Hz. Our dual voltage 1 phase motors are factory tested and certified to operate on both: 104-115/208-230 VAC-1 ph-60 Hz and 100-110/200-22 VAC-1 ph-50 Hz. All voltages above can handle a $\pm 10\%$ voltage fluctuation. Special wound motors can be ordered for voltages outside of certified range.

² Maximum operating temperature: Motor winding temperature (winding rise plus ambient) should not exceed 140°C for Class F rated motor or 120°C for Class B rated motors. Blower outlet air temperature should not exceed 140°C (air temperature rise plus inlet temperature). Performance curve maximum pressure and suction points are based on a 40°C inlet and ambient temperature. Consult factory for inlet and ambient temperatures above 40°C.

³ Maximum blower amps corresponds to the performance point at which the motor or blower temperature rise with a 40°C inlet and ambient temperature reaches the maximum operating temperature.

Specifications subject to change without notice. Please consult your Local Field Sales Engineer for specification updates.

**MISCELLANEOUS
SYSTEM COMPONENTS**

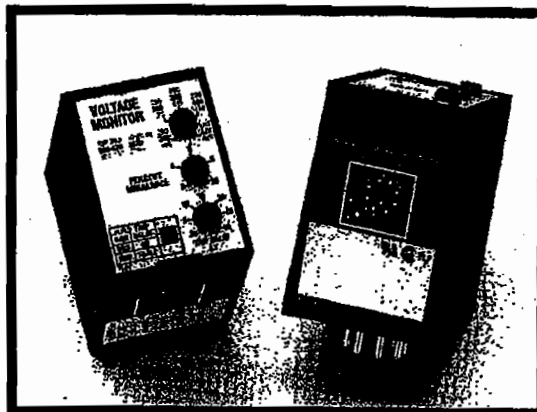
MOTOR PROTECTORS

3 PHASE VOLTAGE MONITORS

PLMU Series

(3 Phase Voltage Monitors with Automatic Voltage Range Selection)

- Protects Against:**
- ☐ Phase Loss
 - ☐ Overvoltage
 - ☐ Phase Reversal
 - ☐ Undervoltage
 - ☐ Unbalanced Voltages
- ☐ Octal Plug-In with SPDT Isolated 10 Amp Contacts
 - ☐ Operates from 200 to 480 VAC
 - ☐ LED Indicator Glows Green when Voltages are Acceptable, Red for Faults
 - ☐ Simple 3 Wire Connection for Delta or Wye Systems
 - ☐ ASME A17.1 rule 210.6; NEMA MG1 14.30, 14.35; IEEE 587-1980 Level B; ANSI Device #27/47/59
 - ☐ Pending - UL File E57310, CSA File LR57415



DESCRIPTION

The PLMU Series of octal plug-in, three phase voltage monitors continuously measures the voltage of each of the three phases. The PLMU Series uses a new microcomputer circuit design that senses under and overvoltage, voltage unbalance, phase loss, and phase reversal. Protection is provided even when regenerated voltages are present. The PLMU is fully adjustable or can be ordered factory fixed (see *Ordering Information*). The nominal input voltage is selected with the knob, the voltage range is automatically selected by the microcomputer (50Hz=240 & 380VAC, 60Hz=240 & 480VAC). The LED indicator glows green when all voltages are acceptable, red when a fault is sensed. Both Delta and Wye systems can be monitored; no connection to neutral is required.

SPECIFICATIONS

1. Line Voltage

- 1.1 Type: Three phase Delta or Wye with no connection to neutral
- 1.2 Input Voltage:
200 to 480VAC +/-15% 50/60 Hertz +/-2Hz
- 1.3 Adjustable Voltage Ranges (Automatic Range Selection):
200 to 240VAC 50 & 60 Hertz
340 to 420VAC 50 Hertz
400 to 480VAC 60 Hertz

1.4 Phase Sequence: ABC

2. Overvoltage, Undervoltage and Voltage Unbalance

- 2.1 Type: Voltage detection with delayed trip and automatic reset
- 2.2 Overvoltage and Undervoltage
 - a. Undervoltage Trip Point: 88 to 92% of adjusted nominal line voltage
 - b. Reset Voltage: +2% of trip voltage
 - c. Overvoltage Trip Point: 109 to 113% of adjusted nominal line voltage
 - d. Reset Voltage: -2% of trip voltage
- 2.3 Voltage Unbalance Between Phases
 - a. Trip Unbalance: adjustable from 2 to 10% of average line voltage or factory fixed 4 to 10%
 - b. Reset on Balance (% of average line voltage):

Selected Unbalance %	2	3	4	5	6	7	8	9	10
Reset %	1.5	2.5	3.5	4.5	5.4	6.3	7.2	8.1	9

2.4 Trip Delay

- a. Range: adjustable from 0.25 to 30 seconds or factory fixed 2 to 30 seconds +/-15% (see *Ordering Information*)
- b. Severe Unbalance: 2X Selected Unbalance Range: 0.25 to 2 secs.; if trip delay is less than 2 secs., the trip delay is used.

3. Phase Reversal and Phase Loss

- 3.1 Response Time: 150 milliseconds maximum
- 3.2 Phase Loss: ≥15% unbalance
- 3.3 Reset: Automatic

4. Output

- 4.1 Type: Electromechanical relay, energized when all conditions are acceptable
- 4.2 Form: Single pole double throw (SPDT)
- 4.3 Rating: 10 amperes resistive @ 240VAC; 1/4 hp @ 125VAC, 1/3 hp @ 250VAC
- 4.4 Life Mechanical — 1,000,000 operations
Electrical — 100,000 operations

5. Protection

- 5.1 Transient Protected to IEEE 587 Level B
CAUTION: 2 amp max. fast acting fuses should be installed externally in series with each line input.
- 5.2 Dielectric: 2500-Volts RMS minimum between input and output terminals.

6. Mechanical

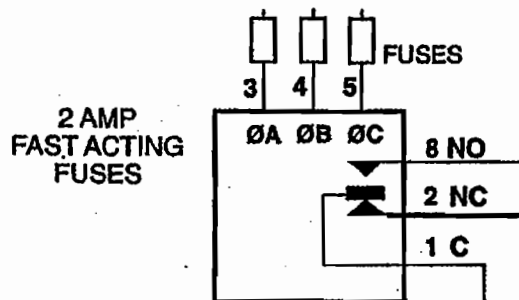
- 6.1 Mounting: 8 pin octal base
CAUTION: Select an octal socket rated for 600VAC operation.
- 6.2 Termination: Octal relay type pins

7. Environmental

- 7.1 Operating Temperature: -40°C to +60°C
- 7.2 Storage Temperature: -40°C to +85°C

See Accessories for: Fuses, Sockets, Panel Mounting Kit, and Hold Down Clips

CONNECTION

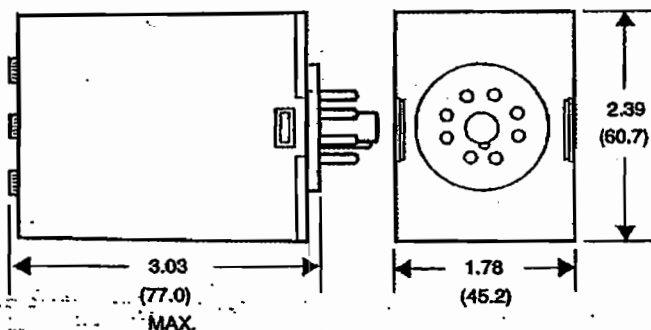


OPERATION

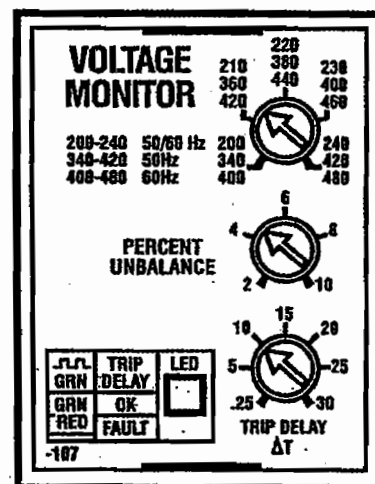
Upon application of power, a 0.6 second random start delay begins. During this delay, the PLMU measures the voltage levels and line frequency in order to properly auto-select the operating voltage range. The output relay is energized and the LED glows green when all voltages are acceptable and the phase sequence is correct. The LED flashes green during the trip delay, then glows red when the output de-energizes. Undervoltage, overvoltage, and voltage unbalance must be sensed for continuous trip delay period before the relay is de-energized. The trip delay will automatically adjust for optimum protection in response to the severity of the voltage unbalance (see Specification 2.4b). Re-energization is automatic upon correction of the fault condition. The output relay will not energize if a fault condition is sensed as three phase input voltage is applied.

The nominal line voltage is selected with the knob; this adjustment sets the over and undervoltage trip points. The voltage range is automatically selected by the micro-computer when voltage is applied.

MECHANICAL



All dimensions in inches (millimeters)



Faceplate View

ORDERING INFORMATION:

Select One From Each Column
Bold Items Are Included in Part Number

Series	Voltage Unbalance In Percent	Trip Delay In Seconds
PLMU	1-Adjustable 2 to 10	1-Adjustable 0.25 to 30
	Fixed specify the unbalance 4, 5, 6, 7, 8, 9, or 10%	Fixed, specify the unbalance 2 to 30 Delays above one second in one second increments

Example Part Numbers: PLMU11 is a fully adjustable voltage monitor for 200 to 480VAC operation.
PLMU42 is fixed at 4% unbalance and a 2 second trip delay.
In Stock Part Number: PLMU11

WARNING! **URETHANE FOAM IS FLAMMABLE!**

Urethane foam, when exposed to heat or ignition sources, may burn. Once ignited, urethane foams can burn rapidly, consuming a high rate of oxygen and releasing hazardous gases, toxic fumes and smoke. In an enclosed space, this may incapacitate or prove fatal to human beings.

Urethane foams can absorb and retain other flammable compounds, such as oil. Urethane foams that have been contaminated in such a way may present an even greater fire hazard.

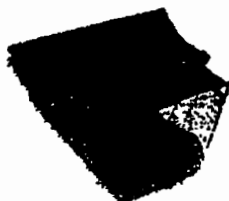
Consideration must be given to the flammability issue when using this product. Do not expose urethane foam to an atmosphere that will contaminate it, nor to ignition or heat sources that may cause it to burn.



® specialists in noise control products and services

industrial noise control, inc.

1411 Jeffrey Drive Addison, Illinois 60101 (630) 620-1998 FAX (630) 620-4928

SORBA-GLAS® NOISE-ABSORBING WALL BLANKETS

- For use on walls or ceilings
- Abrasion resistant silver facing is impervious to water, dust, oil, grease, and most solvents
- Noise-absorbing ceiling or wall coverings used in areas with excessive noise and echoing. Fiberglass center is quilted between a tough silver facing that is highly resistant to abrasion and is impervious to water, dust, oil, grease, and most solvents.

Blanket is 4'W x 8'H and 1" thick. Four grommets along the 4 ft. side of each blanket accept standard hardware for installation.

Sorba-Glas® meets ASTM E-84 Class I Fire Rating. NRC*: 0.75. Industrial Noise Control Brand (110).

No. 57498. Shpg. wt. 12.0 lbs. List ...\$158.91
Each \$143.18; Lots 2\$138.85

(*) Noise Reduction Coefficient (NRC) values are reported per ASTM C 423-84a to the nearest 0.05 Sabine/m².

ALUMINIZED MYLAR ACOUSTICAL FOAM

Available in 10 Ft.
or 25 Ft. Rolls

- Maximum sound absorption
- Reflects light and heat
- Wipe-clean, aluminized film surface resists moisture, lubricants, and fuels
- Flame-retardant finish
- Provides maximum sound absorption while reflecting heat and light. Combines the advantages of flexible, strong foam with a wipe-clean, light reflective 1 mil

aluminized film facing. Recommended for use in dirty environments, as aluminized film protects against moisture, lubricants, and fuels. Meets or exceeds Flame Tests UL-94 and ASTM D1682-74. Temperature limits are -20°F to 120°F continuous. Sold in 1" thick rolls. NRC*: 0.60. Industrial Noise Control brand.

W	Roll Size L	NRC	Stock No.	List	Each	Lots 2	Shpg. Wt.
54"	10 R.	K10-M10	57518	\$126.63	\$107.58	\$102.21	11.0
54"	25	K10-M25	57511	257.75	219.38	206.35	24.0

(*) Noise Reduction Coefficient (NRC) values are reported per ASTM C 423-84a to the nearest 0.05 Sabine/m².

ACOUSTICAL CONVOLUTED FOAM

No. 57493
Acoustical
Convoluted
Foam

Convoluted foam sheets are scientifically developed to absorb low frequency sound when nailed or glued on walls, machine enclosures, ducting systems, privacy panels in offices, sound traps, and computer rooms. Not suitable for use near open flame or sparks.

Cone shape deflects sound waves striking at an angle and allows them to be reflected and reabsorbed by other cones, thus effectively "trapping" sound.

Excellent chemical resistance to most oils, alkali, and mild acids. Temperature resistance is -30°F to 250°F. Foam meets UL-94 Rating (self-extinguishing). Gray color. Sold four 54" x 27" sheets per box. Industrial Noise Control brand.

Thickness (in.)	NRC*	Stock No.	List	Each	Lots 2	Shpg. Wt.
1	0.40	57492	\$84.79	\$72.53	\$72.53	13.0
2	0.70	57493	163.13	139.55	139.55	18.0
3	0.85	57494	232.63	195.28	195.28	23.0

(*) Noise Reduction Coefficient (NRC) values are reported per ASTM C 423-84a to the nearest 0.05 Sabine/m².

Foam Adhesive. Simply spread adhesive on back of foam and allow to set for one minute. Packaged in 11 oz. cartridge for use with any standard caulking gun. Industrial Noise Control brand (PA-02).

No. 57495. Shpg. wt. 1.1 lbs. List \$8.10. Each\$7.38

These products are covered by OSHA Hazard Communication Standard, and Material Safety Data Sheets (MSDS) are available. See page opposite inside back cover.

MODULAR ACOUSTICAL SCREEN

Free-standing, portable units can be used individually or in groups to enclose or divide noisy areas. Completely modular design accommodates changing production layouts. Great around cut-off saws, grinders, small compressors, and fans. Each unit includes a snap-lock tubular steel frame with no loose connections, reinforced loaded vinyl barrier curtain, and quilted fiberglass noise absorber

panel. Mechanical fasteners along each curtain edge seal screens to one another. Metallic gray curtain measures 54"W x 8'H. Tubular steel black epoxy coated frame. Frame measures 4"W x 8'H. Curtain is flame retardant and weighs 1 lb. per sq. ft. Random Noise Reduction Coefficient (NRC): 0.75. Industrial Noise Control brand (NS-117PKD).

No. 57512. Shpg. wt. 52.0 lbs. List \$322.92
Each\$274.25; Lots 2\$260.48

WORK ORDER

CMU200500

SCHEDULE CODE

DATE PRINTED: 2/8/01

DEALER: 011980

SHIP TO:

011980
22205 SE 61ST AVE
PO BOX 520
HAWTHORNE, FL 32640

L & S TRAILERS & SUPPLY
22205 SE 61ST AVE
PO BOX 520
HAWTHORNE, FL 32640

ORDER NO: ORD0005026

PLANT:

ORDER DATE: 2/8/01

STATUS:

DEALER PO# NEPLLO

PROJECTED OFF LINE DATE:

SALESMAN NO: 112

DEALER PHONE NO: 3524

CONTACT:

FAX NO: 000-000-0000

REGION:

PRODUCT CODE

PRODUCT DESCRIPTION

QUANTITY:

GACM812TA2

GACM812TA2

1

SERIAL NO:

VIN NO:

CMU200500

4X4TSE6281U200500

LINE ITEM:

DESCRIPTION

GACM812TA2

GACM812TA2

1

GACM812TA2SM18

STANDARD FEATURES

1

INTERIOR HEIGHT 6" REAR DOUBLE DOORS* BALL SIZE 2 5/16
AXLES (TANDEM) 3500# * TIRES ST205/75R15* FRAME 6" I BEAM
FLOOR (24" OC) 3/4" PLY* SIDE WALLS (16" OC) 3/8" PLY

WHITEM18

WHITEM18

1

GACT209M18

12" ADDITIONAL HEIGHT

12

GACT1073M18

REAR RAMP DOOR W/ SPRING

1

GACT1058M18

32" ENTRANCE DOOR W/ BARLOCK

2

GACT1022M18

STANDARD SCISSOR JACKS W/ HAND

2

GACT261M18

ROOF VENT W/ SCREEN

2

GACT-99M18

12" x 12" FRAMED OPENINGS

2

*M18

SEE PRINT FOR LOCATIONS!!!

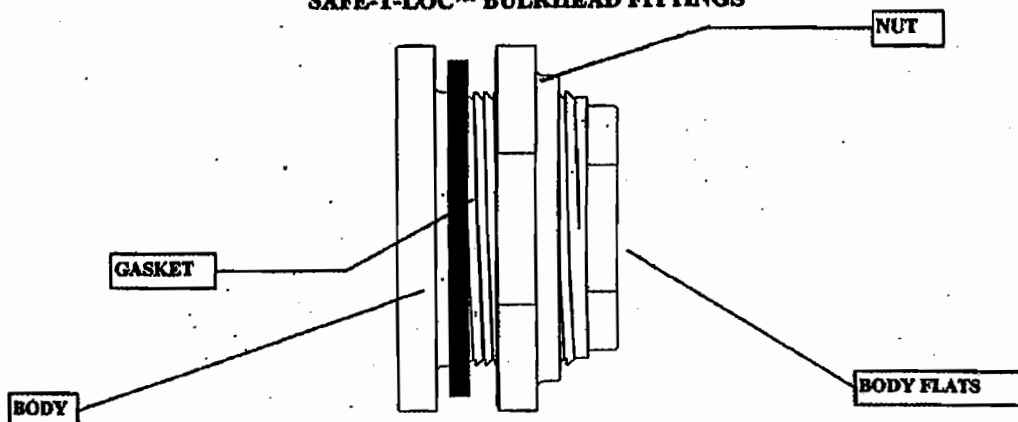
1

COMMENT



HAYWARD INDUSTRIAL PRODUCTS

INSTALLATION DATA FOR SAFE-T-LOC™ BULKHEAD FITTINGS



PLEASE READ THE FOLLOWING INFORMATION PRIOR TO INSTALLING AND USING HAYWARD VALVES, STRAINERS, FILTERS, AND OTHER ASSOCIATED PRODUCTS. FAILURE TO FOLLOW THESE INSTRUCTIONS MAY RESULT IN SERIOUS INJURY.

1. Hayward guarantees its products against defective material and workmanship only. Hayward assumes no responsibility for damage or injuries resulting from improper installation, misapplication, or abuse of any product.
2. Hayward assumes no responsibility for damage or injury resulting from chemical incompatibility between its products and the process fluids to which they are subjected. Compatibility charts provided in Hayward literature are based on ambient temperatures of 70F and are for reference only. Customer should always test to determine application suitability.
3. Consult Hayward literature to determine operating pressure and temperature limitations before installing any Hayward product. Note that the maximum recommended fluid velocity through any Hayward product is eight feet per second. Higher flow rates can result in possible damage due to the water hammer effect. Also note that maximum operating pressure is dependent upon material selection as well as operating temperature.
4. Hayward products are designed primarily for use with non-compressible liquids. They should NEVER be used or tested with compressible fluids such as compressed air or nitrogen.
5. Systems should always be depressurized and drained prior to installing or maintaining Hayward products.
6. Temperature effect on piping systems should always be considered when the systems are initially designed. Piping systems must be designed and supported to prevent excess mechanical loading on Hayward equipment due to system misalignment, weight, shock, vibration, and the effects of thermal expansion and contraction.
7. Because PVC and CPVC plastic products become brittle below 40F, Hayward recommends caution in their installation and use below this temperature.
8. Published operating torque requirements are based upon testing of new valves using clean water at 70F. Valve torque is affected by many factors including fluid chemistry, viscosity, flow rate, and temperature. These should be considered when sizing electric or pneumatic actuators.
9. Due to differential thermal expansion rates between metal and plastic, transmittal of pipe vibration, and pipe loading forces DIRECT INSTALLATION OF METAL PIPE INTO PLASTIC CONNECTIONS IS NOT RECOMMENDED. Wherever installation of plastic valves into metal piping systems is necessary, it is recommended that at least 10 pipe diameter in length of plastic pipe be installed upstream and downstream of the plastic valve to compensate for the factors mentioned above.

INSTALLATION INSTRUCTIONS:

The following table in inches are recommended values.

Bulkhead size	Min Rigid Tank ID	Min Flexible Tank ID	Max Wall	Min Hole	Max Hole
1/2"	7.25	5.56	1.08	1.38	1.41
3/4"	10.00	7.75	1.15	1.63	1.66
1"	11.75	8.94	1.15	1.87	1.91
1-1/4"	16.25	12.19	1.02	2.37	2.41
1-1/2"	16.25	12.19	1.02	2.37	2.41
2"	25.75	19.38	1.09	3.25	3.28
3"	42.50	36.25	1.14	4.50	4.54
4"	90.00	76.81	1.69	5.72	5.78

THE SYSTEM AND TANK SHOULD BE DEPRESSURIZED AND DRAINED BEFORE ATTEMPTING TO INSTALL A BULKHEAD FITTING. VENTING AND PROPER PERSONAL PROTECTION EQUIPMENT SHOULD BE USED WHEN ENTERING TANKS.

THE BULKHEAD FITTING SHOULD BE INSTALLED WITH THE BODY AND THE GASKET ON THE INSIDE OF THE TANK. TORQUE THE NUT WHILE HOLDING THE BODY. THE NUT CAN BE TORQUED FROM THE OUTSIDE OF THE TANK BY HOLDING THE FLATS ON THE BODY END WHILE TURNING THE NUT.

THREADED CONNECTION:

Threaded end connections are manufactured to ASTM specifications D2464-88, F437-88 and ANSI B2.1. Wrap threads of pipe with Teflon tape of 3 to 3-1/2 mil thickness. The tape should be wrapped in a clockwise direction starting at the first or second full thread. Overlap each wrap by 1/2 the width of the tape. The wrap should be applied with sufficient tension to allow the threads of a single wrapped area to show through without cutting the tape. The wrap should continue for the full effective length of the thread. Pipe sizes 2" and greater will not benefit with more than a second wrap, due to the greater thread depth. To provide a leak proof joint, the pipe should be threaded into the bulkhead fitting "hand tight". Using a strap wrench only. (Never use a stillson type wrench) tighten the joint an additional 1/2 to 1-1/2 turns past hand tight. Tightening beyond this point may induce excessive stress that could cause failure.

SOCKET CONNECTION:

Socket connections are manufactured to ASTM D2467-94. Solvent cementing of socket connections to pipe should be performed per ASTM specifications D2855-87. Cut pipe square. Chamfer and deburr pipe. Surfaces must be cleaned and free of dirt, moisture, oil and other foreign material. Apply primer to inside socket surface. Use a scrubbing motion. Repeat applications may be necessary to soften the surface of the socket. Next, liberally apply primer to the male end of the pipe to the length of the socket depth. Again apply to the socket, without delay apply cement to the pipe while the surface is still wet with primer. Next apply cement lightly, but uniformly to the inside of the socket. Apply a second coat of cement to the pipe, and assemble the pipe into the socket, rotating the pipe 1/4 turn in one direction as it is slipped to full depth of the socket. The pipe should be held in position for approx. 30 seconds to allow the connection to "set". After assembly wipe off excess cement. Full set time is a minimum of 30 minutes at 60 to 100 F. Full cure time should be based on the chart below.

JOINT CURE SCHEDULE:

The cure schedules are suggested as guides. They are based on laboratory test data, and should not be taken to be the recommendations of all cement manufacturers. Individual manufacturer's recommendations for their particular cement should be followed.

Temperature Range During Cure Period(B) °F(°C)	Test Pressures for Pipe Sizes 1/2 to 1-1/4 IN		Test Pressures for Pipe Sizes 1-1/2 to 3 IN		Test Pressures for Pipe Size 4 in	
	Up to 180 PSI (1240 kPa)	Above 180 to 370 PSI (1240 to 2550 kPa)	Up to 180 PSI (1240 kPa)	Above 180 to 315 PSI 1240 to 2170 kPa	Up to 80 PSI (1240 kPa)	Above 180 to 315 PSI 2170 kPa
60 to 100 (15 to 40)	1 hr	6 hr	2 hr	12 hr	6 hr	24 hr
40 to 60 (-5 to 15)	2 hr	12 hr	4 hr	24 hr	12 hr	48 hr
20 to 40 (-7 to 5)	6 hr	36 hr	12 hr	72 hr	36 hr (A)	4 days (A)
10 to 20 (-15 to 7)	8 hr	48 hr	16 hr	96 hr	72 hr (A)	8 days (A)

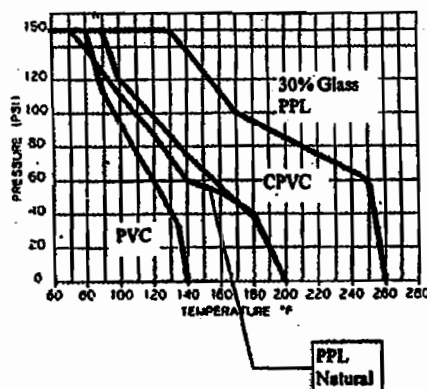
Colder than 10 (-15) Extreme care should be exercised on all joints made where pipe, fittings or cement is below 10°F.

A: It is important to note that at temperatures colder than 20°F on sizes that exceed 3 in., test results indicate that many variables exist in the actual cure rate of the joint. The data expressed in these categories represent only estimated averages. In some cases, cure will be achieved in less time; but isolated test results indicate that even longer periods of cure may be required.

B: These cure schedules are based on laboratory test data obtained on Net Fit Joints (NET FIT = in a dry fit the pipe bottoms snugly in the fitting socket without meeting interference).

NON SHOCK
OPERATING
PRESSURES

BFIS REV B
8/18/99
ECR 819R





INSTALLATION AND MAINTENANCE DATA SHEET

A51 Series lighting fixtures for:
Class I, Division 1, Groups C and D;
Class II, Division 1, Groups E, F, and G

DIRECTIONS FOR FIXTURE INSTALLATION

⚠ WARNING GENERAL

1. DO NOT MODIFY UNIT IN ANY WAY. Modification may affect safety and reliability.
2. Improper use or failure to follow these instructions could result in serious injury or property damage.
3. Operator should be instructed in the safe and proper usage and maintenance of this product.

⚠ WARNING ELECTRICAL

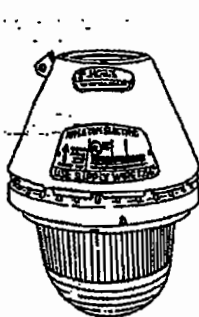
1. Disconnect electrical power before installation, adjustment and maintenance.
2. DO NOT overload; the amperage and voltage indicated on the nameplate must not be exceeded.
3. Check continuity before connecting electrical power.
4. All installations must comply with applicable local and/or National Electrical Code.
5. Before installing check fixture unit nameplate and carton labels to be sure you have correct fixture and mounting hood. Circuit must be deactivated before installing fixture.

⚠ CAUTION GENERAL

1. All A-51 Series Fixtures are to be mounted vertically with lamp base up.

The fixture unit must be installed with one of the following mounting hoods for safe operation. Failure to use fixture unit with one of the following mounting hoods voids warranty as well as the U.L. Listing and creates the risk of fire or explosion.

Fixture unit must be installed with:



AAP-50, AAP-75 or AAP-100
Pendant Hood



AAC-50, AAC-75 or AAC-100
Ceiling Hood



AALB-50, AALB-75 or AALB-100
Long Wall Bracket Hood

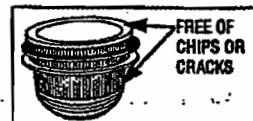


AASB-50, AASB-75
Short Wall Bracket Hood

1. Use the installation drawing as a guide. Install mounting hood first as all wiring connections are made in the mounting hood. The fixture unit requires no internal wiring connections.
 - Install mounting hood to conduit system (and/or wall, ceiling or stanchion). If using pendant or stanchion mounting hood, secure the hood to the conduit system with the set screw.
2. Remove the connection block (VPT7) from the mounting hood by loosening (but not removing) the two Phillips head screws. Turn connection block counter-clockwise to remove.
3. When using ceiling bracket (AAC-), long wall bracket (AALB-), or short wall bracket (AASB-), mounting hoods, threaded adapter (59064050000) can be removed by lifting gasket (59064034000) to access set screw.
 - Loosen set screw and turn adapter counter-clockwise for easier access to junction box. If long bracket (AALB-) is being used, bracket can be removed from junction box by loosening set screw in flange and turning counter clockwise.
4. Pull supply wires from the conduit into the junction box. Make connection of supply wires to the VPT-7 connection block by attaching "HOT" voltage lead to the brass terminal and common "neutral" lead to silver terminal.
5. Secure threaded adapter (where applicable) or long bracket (where applicable) to junction box and tighten all set screws.
6. Secure VPT-7 connection block to threaded adapter or mounting hood by slipping over Phillips head screws, turning clockwise and tightening screws.
7. Install lamp into fixture unit. See directions under "Lamp Installation Instructions".
8. Inspect threads of mounting hoods and the fixture unit to be sure they are clean and free of damage.
 - Inspect globe for any chips, scratches or cracks.

⚠ CAUTION GENERAL

Chipped, scratched or cracked globes will fall. Replace any such defective lamp housing.

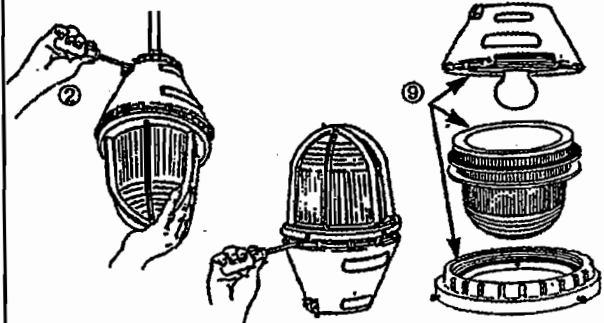


9. Thread the fixture unit into mating threads of mounting hood until tight against gasket of mounting hood. Locking spring of fixture unit should engage with notches on mounting hood.
10. Install guard and/or reflector if desired. Check tightness of set screws and all threaded joints. Activate supply circuit to test fixture.

KEEP THIS MANUAL FOR FUTURE REFERENCE

LAMP INSTALLATION INSTRUCTIONS

FIGURE 1



CAUTION: All A-51 series fixtures are to be mounted vertically with lamp base up.

NOTE: All installations must comply with applicable local and/or National Electrical Code.

- A lamp may be safely and easily installed into the fixture at a work bench.
- 1. Disconnect fixture from supply circuit.
- 2. Remove fixture unit from mounting hood by inserting screw driver into canopy notches and using release lugs for leverage.
 - Once loosened from mounting hood, fixture unit can be quickly unscrewed by hand. Do not remove fixture unit from mounting hood under load.
- 3. Place fixture unit on bench with globe side up.
- 4. Remove globe ring using pry notches if necessary.
- 5. Remove aluminum and fiber gaskets.
- 6. Lift globe carefully off of fixture and place safely on clean surface.
- 7. Refer to fixture nameplate for proper lamp wattage and types.
- 8. Inspect globe for chips or scratches as such defects will result in globe failure.
- 9. Wipe ground surface of globe and mating surface of fixture with soft clean cloth to eliminate dust, oil or grit.
- 10. Carefully place globe back on ground surface of fixture unit.
- 11. Place the fiber gasket on globe flange first, then place aluminum gasket on top of fiber gasket.
 - This sequence is important for safe operation of fixture.
- 12. Replace globe ring carefully and screw onto fixture unit until globe ring is tightly in place.
- 13. Thread fixture unit into mounting hood as per "Directions for Fixture Installation, Numbers 9 and 10".

CAUTION: Disconnect supply circuit before opening or relamping fixture.

MAINTENANCE DATA

• To relamp, see "Lamp Installation Instructions."

• To maintain maximum light output from this fixture, it should be cleaned periodically as follows:

1. The aluminum exterior of this fixture should be cleaned only with a mild soap or cleaner, and should be rinsed with water immediately. *Alkaline or acidic cleaners will attack the protective coating of epoxy on the fixture and should not be used.* This will allow the epoxy to protect the fixture from corrosive elements in the atmosphere and result in longer fixture life.
2. The glass globe should be cleaned using a soft cloth and a non-abrasive cleaner. The globe should be regularly inspected for scratches or chips. If the globe is scratched or chipped, it must be replaced.
3. The porcelain enamel reflector may be cleaned with any non-abrasive detergent or glass cleaner.
 - These periodic cleaning procedures are important to prevent the accumulation of dust and dirt which will impair the light output of the fixture.
 - When relamping, be careful not to damage the external threaded areas, since they maintain the fixture's explosion-proof properties.
 - When removing and repairing fixture, lubricate threads only with Appleton TLC-3 conductive, high temperature lubricant. This should only be necessary if threads are no longer coated with the blue or black color of the dry film lubricant.
 - See attached drawing for replacement parts list

OPERATIONAL DATA

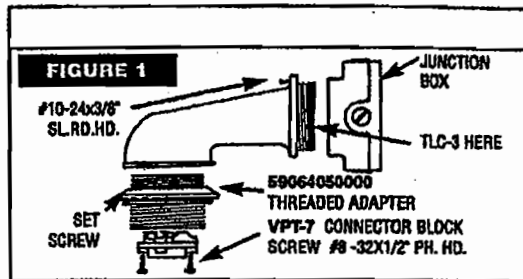
- The fixture must be operated in an environment that does not exceed 40°C.
- The fixture may be operated on AC power only up to 300 volts. Use lamp rated for operating voltage.

WARNING:

- To reduce the risk of fire or explosion, do not install where the operating temperature exceeds ignition temperature of hazardous atmospheres.
- Refer to the nameplate on the fixture for maximum operating temperature and for proper fixture classification.

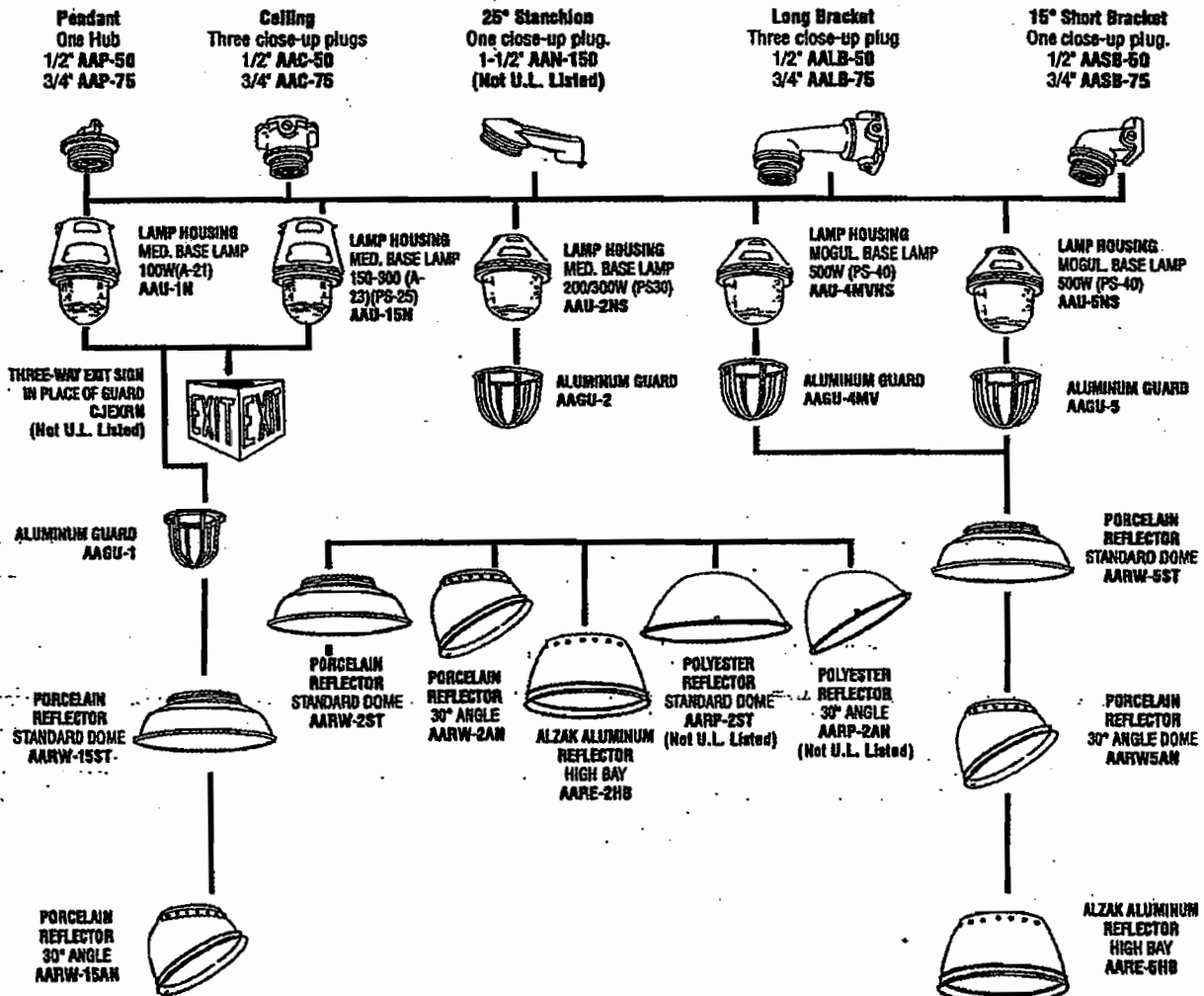
LONG BRACKET INSTALLATION

1. Remove bracket from junction box, pull through leads to connector block. Attach ground wire to grounding screw.
2. Remove Connector block from threaded adapter, pull leads through to connect wires to correct terminal screws.
3. Push block into place and tighten screws — install fixture. **NOTE:** Plugs should be removed and resealed with pipe sealant.

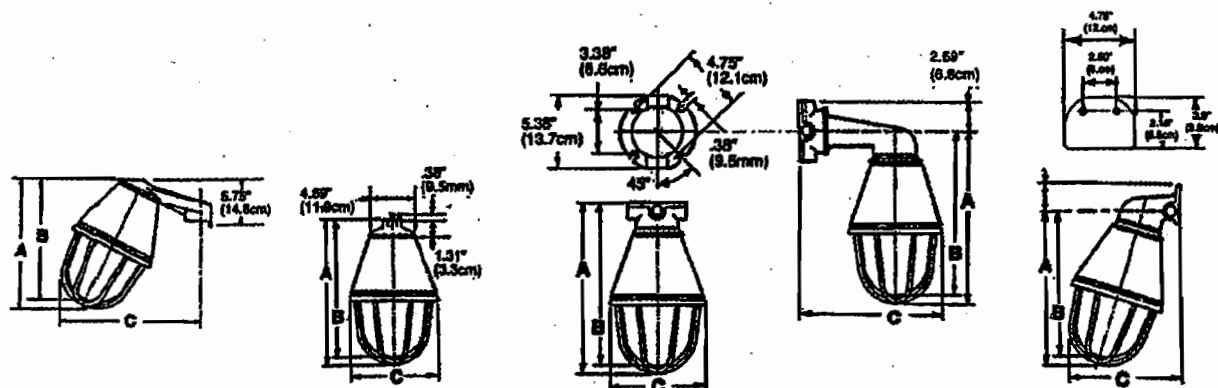


A-51 GROUPS C & D LIGHTING FIXTURES FAMILY TREE

MOUNTING HOODS (Use of components marked "Not U.L. Listed" voids the U.L. Listing of the assembled fixture.)



Dimensions: A-51 Incandescent Lighting Fixtures.



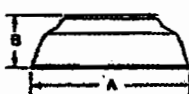
Dimensions in Inches

Size (Watts)	Stanchion			Pendant			Ceiling			Long Bracket			Short Bracket		
	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C
60-100	11.47	10.85	11.50	12.25	11.63	7.06	13.75	13.13	7.06	13.75	13.13	12.38	13.56	12.94	9.13
150-300	11.47	10.85	11.50	12.25	11.63	7.06	13.75	13.13	7.06	13.75	13.13	12.38	13.56	12.94	9.13
200-300	13.07	12.38	12.71	13.94	13.25	8.81	15.44	14.75	8.81	15.50	14.75	13.25	15.19	14.50	10.13
300-500	15.09	14.34	14.64	16.00	15.25	12.13	17.50	17.75	12.13	17.50	16.75	14.88	17.25	16.50	11.94

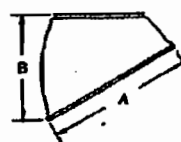
A-51 Series Reflectors

Size Watts	STD. DOME		30° ANGLE		HIGH BAY	
	A	B	A	B	A	B
60-100	12.00	4.50	10.00	7.63	—	—
150-200	14.00	4.38	10.00	7.63	—	—
200-300	16.00	5.19	12.00	7.88	12.00	6.06
300-500	20.00	6.84	18.00	13.13	18.00	9.13

STANDARD DOME



30° ANGLE



HIGH BAY



Please read and save these instructions. Read carefully before attempting to assemble, install, operate or maintain the product described. Protect yourself and others by observing all safety information. Failure to comply with instructions could result in personal injury and/or property damage! Retain instructions for future reference.

Dayton® Hazardous Location Exhaust Fans

Description

Dayton hazardous location exhaust fans are used for air exhausting jobs in atmospheres containing flammable or explosive vapors or gases as defined under section 500 of the National Electrical Code (NEC). Each unit is equipped with a non-sparking, cast aluminum fan blade and a U.L. Listed Class I, Div. I, Group D and Class II, Div. I, Groups E, F and G, totally enclosed, hazardous location, ball bearing motor with automatic reset thermal protection.

NOTE: Model 3C772 is a 6-wing fan blade unit. All other models have 4-wing fan blades.

Unpacking

1. When receiving the unit, inspect carefully for any damage that may have occurred during transit.
2. Shipping damage claim must be filed with carrier.

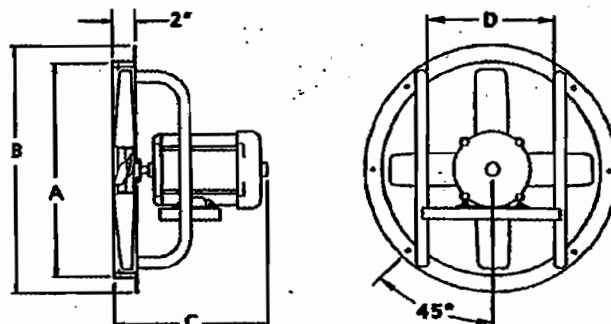


Figure 1 - Dimensions

Dimensions

Model	A (Dia.)	B (Dia.)	C	D
4C020B	13 1/4"	16 1/4"	12 5/8"	7"
4C369A	17 1/4"	20 1/4"	13 7/8"	11 1/4"
4C370A	19 1/4"	22 1/4"	13 5/8"	11 1/4"
2C963B	21 1/4"	24 1/4"	13 1/2"	11 1/4"
2C856B	25 1/4"	28 1/4"	13 3/4"	11 1/4"
4C371A	25 1/4"	28 1/4"	13 7/8"	11 1/4"
3C772	30 1/2"	33 1/2"	15 1/8"	11 1/4"

Specifications

Model	Blade Dia.	CFM Air Delivery @ SP Shown		Motor			HP	RPM	Full Load Amps
		Free Air	1/8"	1/4"	3/8"				
4C020B	12"	855	645	330	175		1/4	1725	4.5
4C369A	16	2000	1640	1260	750		1/4	1725	4.5
4C370A	18	2210	1810	1300	800		1/4	1725	4.5
2C963B	20	2475	1860	1350	850		1/4	1725	4.5
2C856B	24	3535	2520	1720	1000		1/3	1725	6.4
4C371A	24	4265	3320	2480	2200		1/2	1725	9.0/4.5 †
3C772	30	7135	6000	5000	3500		3/4	1140	9.6/4.8 †

Test data was obtained in a laboratory registered by AMCA for (AMCA 210 air performance) testing. Data is not certified by AMCA.

(†) Full load amps 115/230 voltage.

General Safety Information

WARNING Disconnect power source before installing or servicing. Failure to disconnect power source can result in fire, shock or serious injury.

1. This fan should be installed by a qualified technician.
2. Follow all local electrical and safety codes, as the National Electrical Code (NEC) and the Occupational Safety and Health Act (OSHA).
3. Motor must be securely and adequately grounded. This can be accomplished by wiring with a grounded, metal-clad raceway system, by using a separate ground wire connected to the bare metal of the motor frame, or other suitable means.

Dayton Hazardous Location Exhaust Fans

General Safety Information (Continued)

4. Always disconnect power source before working on or near a motor or its connected load. If power disconnect point is out-of-sight, lock it in the open position and tag to prevent unexpected application of power.
5. Guarding is required in accordance with OSHA requirements if fan is mounted less than 7 feet above floor or where workers have access. Dayton intake guard, Models 6D581 thru 6D591 are strongly recommended.
6. Be careful when touching the exterior of an operating motor; it may be hot enough to be painful or cause injury. With modern motors this condition is normal if operated at rated load and voltage. Modern motors are built to operate at higher temperatures.
7. Protect power cable from coming into contact with sharp objects.
8. Do not kink power cable and never allow cable to come in contact with oil, grease, hot surfaces, or chemicals.
9. Make certain that the power source conforms to requirements of your equipment.
10. Wiping or cleaning rags and other flammable waste materials must be placed in a tightly closed metal container and disposed of later in the proper fashion.
11. When cleaning electrical or electronic equipment, always use an approved cleaning agent such as dry cleaning solvent.

Installation

⚠ WARNING Not for use where paint residue can accumulate on motor.

⚠ WARNING Disconnect power source before installing or servicing. Failure to disconnect power source can result in fire, shock or serious injury.

1. Mount the fan to a panel securely anchored to studs or wall framing.
2. Connect power leads to motor, using an approved wiring method. (Motor terminal connection data is provided on motor nameplate or on motor terminal box cover plate. Use adequate size wire for all branch and feeder runs). Incorrect motor connections will cause poor fan performance and/or motor failure. Wiring diagrams for Models 2C856A, 2C963B, 4C020B, 4C369A, 4C370A (see Figure 2). Models 4C371A and 3C772 (see Figure 3) for motor wiring diagram.

⚠ CAUTION For safety, a lockable disconnect switch should be located near fan so power can be positively disconnected while servicing fan.

⚠ WARNING Fan frame and motor must be electrically grounded to a suitable electrical ground such as a grounded water pipe, or properly grounded metallic raceway or ground wire system.

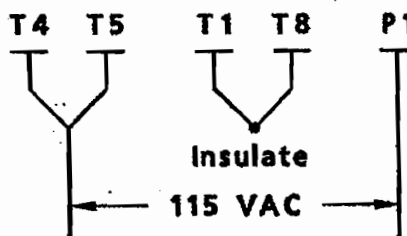


Figure 2 - Wiring Diagram for Single 115V Motor

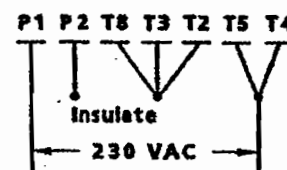
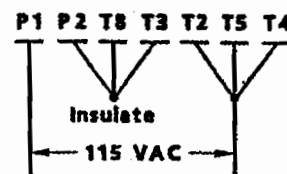


Figure 3 - Wiring Diagram for Dual 115/230V Motor

3. Before applying power to the fan, check for obstructions which would interfere with fan operation.

NOTE: Fan blade must turn clockwise when facing the shaft of the motor. If rotation is incorrect, refer to motor nameplate for reversing instructions.

Maintenance

⚠ WARNING Make certain that the power source is disconnected before attempting to service or disassemble any components! If the power disconnect is out-of-sight, lock in open position and tag to prevent application of power.

CLEANING:

It is advisable to clean motor and fan blade at regular intervals. This will remove any accumulated dirt which would cause unbalance and result in excessive vibration. If guarding has been added it should be removed and cleaned at regular intervals to maintain power air flow and prevent possible motor overloading.

LUBRICATION:

Motor is prelubricated at factory and will not require any further lubrication.

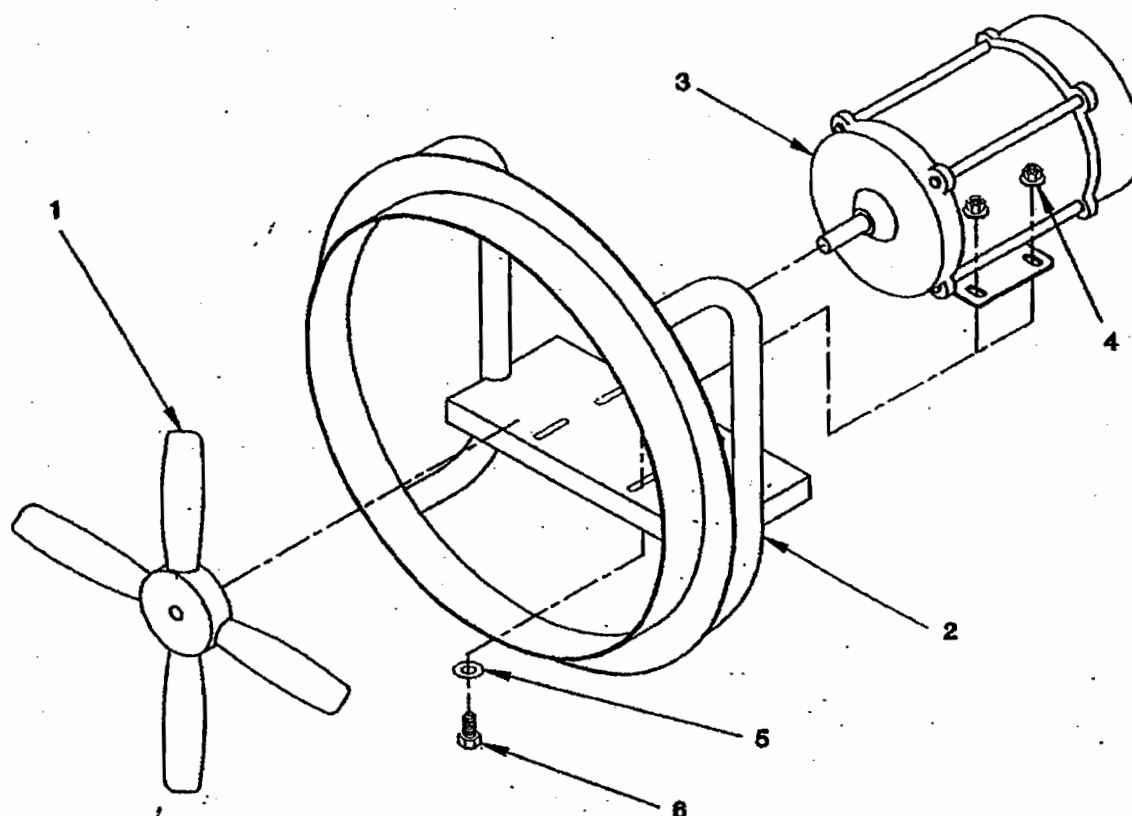
For Replacement Parts, call 1-800-323-0620

Please provide following information:

- Model number
- Serial number (if any)
- Part descriptions and number as shown in parts list

Address parts correspondence to:

Parts Company of America
1657 Shermer Road
Northbrook, IL 60062-5362

**Figure 4 — Replacement Parts Illustration****Replacement Parts List**

Ref. No.	Description	Part Number For Models:							Qty.
		4C020B	4C369A	4C370A	2C963B	2C856B	4C371A	3C772	
1	Fan blade	4C386	4C133A	4C135A	4C139A	4C145A	4C147A	03221001	1
2	Frame	42083002	42084002	42085002	42086002	42087002	42087002	42153001	1
3	Motor	6K734	6K734	6K734	6K734	6K738	6K039	13130001	1
4	5/16-24 Spinlock nut	*	*	*	*	*	*	*	4
5	5/16" Flat washer	*	*	*	*	*	*	*	4
6	5/16-24 x 3/4" HHC screw	*	*	*	*	*	*	*	4

(*) Standard hardware items, available locally.

Dayton Hazardous Location Exhaust Fans

Troubleshooting Chart

Symptom	Possible Cause(s)	Corrective Action
Excessive noise	1. Defective motor bearing 2. Loose fan blade 3. Crooked or damaged fan blade 4. Motor not securely anchored	1. Replace 2. Tighten setscrew 3. Replace 4. Secure properly
Fan inoperative	1. Blown fuse or open circuit breaker 2. Electricity turned off 3. Defective motor	1. Repair or replace 2. Contact local power company 3. Repair or replace
Insufficient air flow	Blocked intake or exhaust opening	Clear obstruction or increase size of opening

Limited Warranty

Dayton One-Year Limited Warranty. Hazardous Location Exhaust Fans, Models 2C856B, 2C963B, 3C772, 4C020B and 4C369A thru 4C371A, are warranted by Dayton Electric Mfg. Co. (Dayton) to the original user against defects in workmanship or materials under normal use for one year after date of purchase. Any part which is determined to be defective in material or workmanship and returned to an authorized service location, as Dayton designates, shipping costs prepaid, will be, as the exclusive remedy, repaired or replaced at Dayton's option. For limited warranty claim procedures, see PROMPT DISPOSITION below. This limited warranty gives purchasers specific legal rights which vary from state to state.

Limitation of Liability. To the extent allowable under applicable law, Dayton's liability for consequential and incidental damages is expressly disclaimed. Dayton's liability in all events is limited to and shall not exceed the purchase price paid.

Warranty Disclaimer. Dayton has made a diligent effort to illustrate and describe the products in this literature accurately; however, such illustrations and descriptions are for the sole purpose of identification, and do not express or imply a warranty that the products are merchantable, or fit for a particular purpose, or that the products will necessarily conform to the illustrations or descriptions.

Except as provided below, no warranty or affirmation of fact, expressed or implied, other than as stated in the "LIMITED WARRANTY" above is made or authorized by Dayton.

Product Suitability. Many states and localities have codes and regulations governing sales, construction, installation, and/or use of products for certain purposes, which may vary from those in neighboring areas. While Dayton attempts to assure that its products comply with such codes, it cannot guarantee compliance, and cannot be responsible for how the product is installed or used. Before purchase and use of a product, please review the product application, and national and local codes and regulations, and be sure that the product, installation, and use will comply with them.

Certain aspects of disclaimers are not applicable to consumer products; e.g., (a) some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you; (b) also, some states do not allow a limitation on how long an implied warranty lasts, consequently the above limitation may not apply to you; and (c) by law, during the period of this limited warranty, any implied warranty of implied merchantability or fitness for a particular purpose applicable to consumer products purchased by consumers, may not be excluded or otherwise disclaimed.

Prompt Disposition. Dayton will make a good faith effort for prompt correction or other adjustment with respect to any product which proves to be defective within limited warranty. For any product believed to be defective within limited warranty, first write or call dealer from whom the product was purchased. Dealer will give additional directions. If unable to resolve satisfactorily, write to Dayton at address below, giving dealer's name, address, date, and number of dealer's invoice, and describing the nature of the defect. Title and risk of loss pass to buyer on delivery to common carrier. If product was damaged in transit to you, file claim with carrier.

Manufactured for Dayton Electric Mfg. Co., 5959 W. Howard St., Niles, Illinois 60714 U.S.A.

Manufactured for Dayton Electric Mfg. Co.
Niles, Illinois 60714 U.S.A.

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Dayton®

COLUMBUS ELECTRIC MANUFACTURING

OPERATION & INSTALLATION MANUAL

EP-ETD-8D
EP-ETD-8S

DPDT HEAT/COOL
SPDT HEAT/COOL

EXPLOSION PROOF THERMOSTAT

The Columbus Electric Explosion Proof Thermostat is designed to control heating only, cooling only, heating and cool or ventilation systems in oil refineries, grain elevators, munition plants, hospital operating rooms and other hazardous locations.

The switch mechanism is enclosed in a 1/2" thick cast aluminum case which is dust proof and dust resistant. A reliable sensing element provides accurate response to temperature change and does not require leveling during installation.

The casing is tapped top and bottom for 3/4" conduit, a 1/2" adaptor is provided.

SPECIFICATIONS

Electrical Rating: 22 Amp 125-277 VAC
3/4 HP at 125 VAC
1 1/2 HP 250/277 VAC

Dimensions: 5.62" x 6.37" x 4.43"
Approvals: U.L. AND C.S.A.
Class I Groups C & D
Class II Groups E, F, & G

Differential: Heat: 2°F/Cool: 4°F

Temp Set Range: 50°F to 90°F

INSTALLATION

ALL WIRING MUST COMPLY WITH NEPA-70(NEC), LOCAL CODES AND ORDINANCES:

Locate the thermostat approximately five feet (5') above the floor in a location that will sense the average temperature of the area to be controlled. Do not mount the thermostat adjacent to water pipes, in drafty areas, or other locations that would adversely affect the operation of the thermostat.

- 1) Remove the cover of the thermostat and set it aside. Exercise care not to mar the mating surface or damage the temperature sensing/operating components. CAUTION: Marring of the mating surfaces of the enclosure could destroy the integrity of the seal causing an unsafe condition during operation of the thermostat.
- 2) Mount the thermostat base on the surface selected. See Fig. 1 for dimensions.
- 3) The base is tapped for 3/4" conduit; a 1/2" conduit adaptor and a 3/4" plug is provided. Two openings are provided. Unused openings must be properly plugged with plugs provided, prior to applying power to the unit.
- 4) Connect the conduit to the mounted base and place the required wire into the base.
- 5) Connections are to be made to the switch terminals on the cover, see Fig. 2. The cover can then be installed to the base and securely fastened utilizing the four (4) mounting screws. Immediately prior to assembly, inspect the mating surfaces of the cover and enclosure. Do not connect if surfaces are uneven or gaps exist between the cover and enclosure. Install the four (4) cover screws to enclosure and TIGHTEN TO A MINIMUM OF 40 INCH POUNDS.
- 6) The installer must seal each conduit run within 18" of the thermostat enclosure. This seal must be a suitable listed hazardous location fitting.

DIAGRAMS

FIG 1

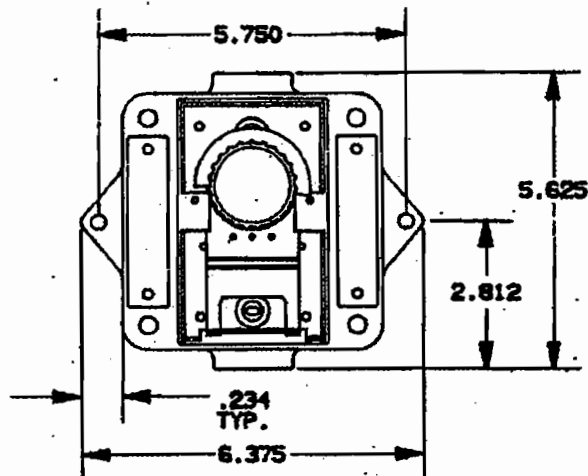
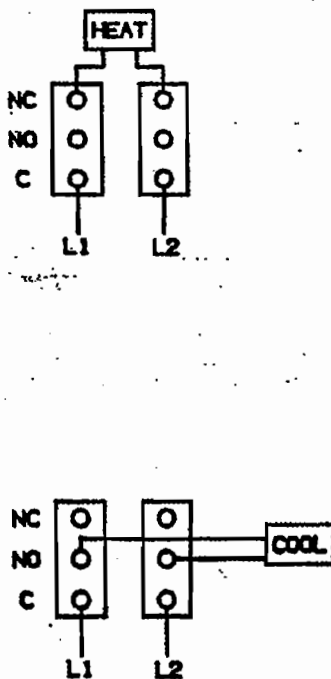
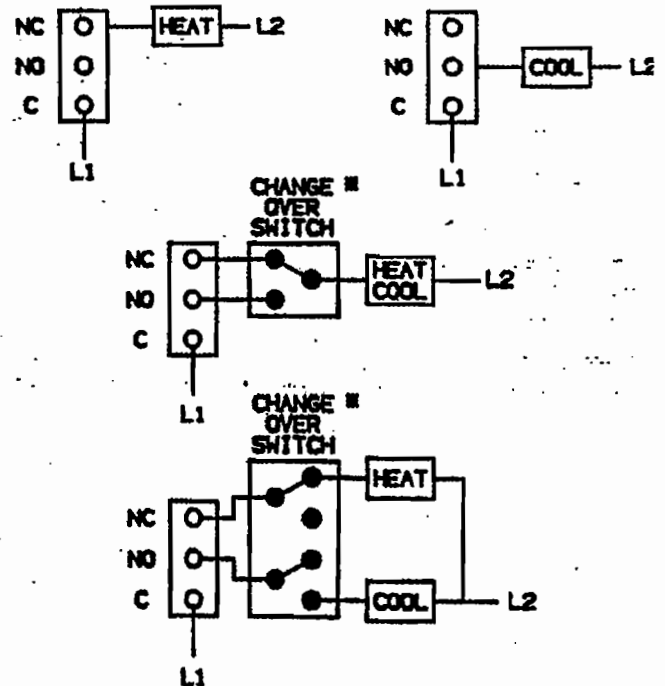


FIG 2
TYPICAL WIRING DIAGRAMS

EP-ETD-8D



EP-ETD-8S



■ TO BE PROVIDED BY INSTALLER

P.O. BOX 4973, JOHNSON CITY, TENNESSEE 37602

Measurement Accessories

Blower Connection Key	
NPT	American National Standard Taper Pipe Thread (Male)
NPSC	American National Standard Straight Pipe Thread for Coupling (Female)
SO	Slip On (Smooth - No Threads)

Air Flow Meter

FEATURES

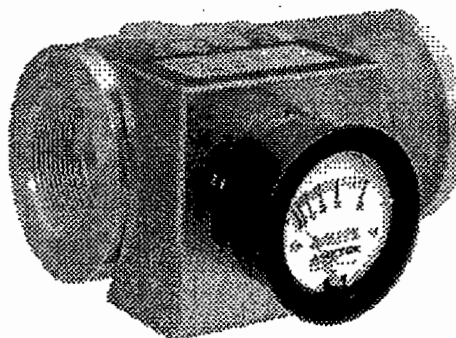
- Direct reading in SCFM
- Low pressure drop (2-4" typical) across the flow meter
- Non-clogging, low impedance air stream
- Light weight aluminum
- No moving parts
- Large easy-to-read dial
- Accurate within 2% at standard conditions
- Good repeatability
- Available in 2", 3" and 4" sizes
- Factory configured for quick installation
- .048" Allen key supplied for gauge adjustment

OPTIONS

- For 4-20 mA outputs and digital readouts see page G-9
- High temperature version (above 140°F)
- Corrosion-resistant version with Chem-Tough™ or in stainless steel
- FDA-approved Food Tough™ surface conversion
- High pressure version (100 PSI)

BENEFITS

- **OPTIMIZE SYSTEM EFFICIENCY**
Measuring the correct air flow can assist you in fine-tuning to your system's optimal efficiency.
- **BALANCE MULTI-PIPING SYSTEMS**
When evacuating CFM from more than one pipe, different run lengths or end system impedance can cause one pipe to handle more CFM than the other. With an accurate CFM reading, piping can be balanced by bleeding air in/out or by creating an extra impedance.
- **DETECT CHANNELING OR PLUGGING**
For systems in which channeling or plugging can occur, a change in the CFM measured can help indicate the unseen changes in your system.



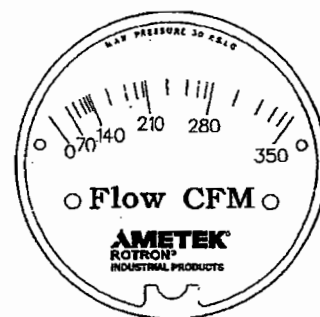
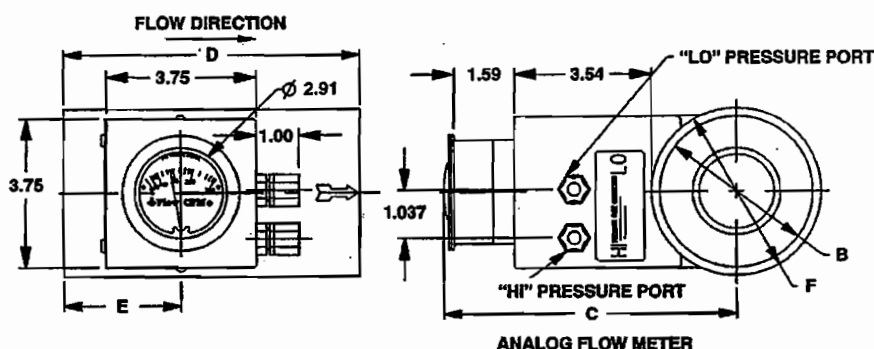
Current Models		Flow Range (SCFM)	B Threads	C Length	D Width	E	F
Model	Part #						
FM20C030Q	550599	6-30	2" - 11.5 NPSC	7.18"	7.0"	2.0"	3.75"
FM20C045Q	550600	9-45					
FM20C065Q	550601	13-65					
FM20C125Q	550602	25-125					
FM20C175Q	550603	35-175					
FM20C225Q	550604	45-225			5.6"		
FM30C250Q	550605	50-250	3" - 8 NPSC	7.52"	7.4"	2.5"	4.43"
FM30C350Q	550606	70-350					
FM30C475Q	550607	95-475					
FM40C450Q	550608	90-450	4" - 8 NPSC	8.00"	7.7"	2.7"	5.43"
FM40C600Q	550609	120-600					
FM40C850Q	550610	170-850					

AMETEK® Rotron® Industrial Products

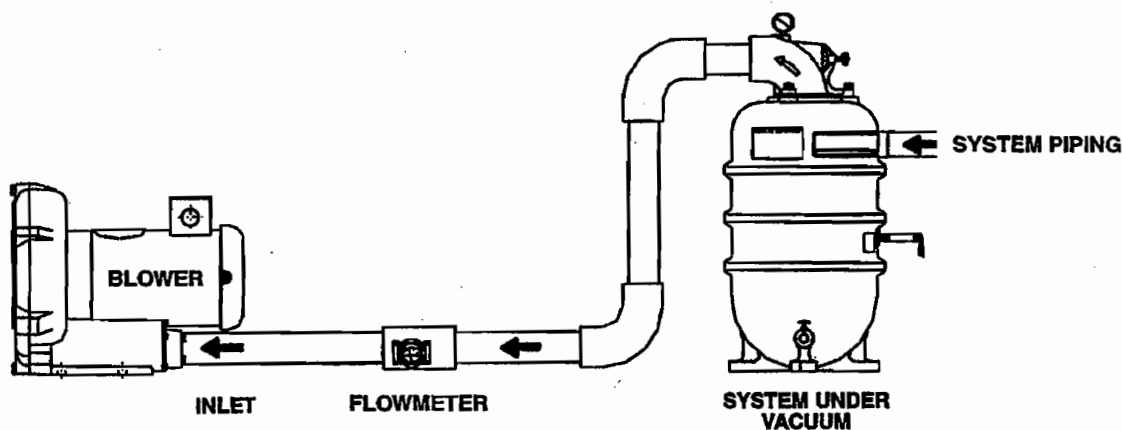
Blower Model Reference Key	
A = SPIRAL	E = DR/EN/CP 656, 6, 623, S7
B = DR/EN/CP 068, 083, 101, 202	F = DR/EN/CP 707, 808, 858, S9, P9 (Inlet Only)
C = DR/EN/CP 303, 312, 313, 353	G = DR/EN/CP 823, S13, P13 (Inlet Only)
D = DR/EN/CP 404, 454, 513, 505, 555, 523	H = DR/EN/CP 909, 979, 1223, 14, S15, P15 (Inlet Only)

Measurement Accessories

TYPICAL FLOW METER ARRANGEMENT



TYPICAL GAUGE FACE



HIGH TEMPERATURE/PRESSURE CORRECTION

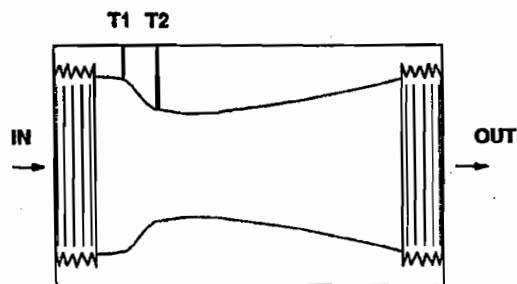
$$SCFM_2 = \frac{SCFM_1}{\left(\frac{14.7}{P_{f2}} \right) \times \left(\frac{530}{T_{f2} + 460} \right)}$$

P_{f2} = Absolute Pressure in PSIA

T_{f2} = Temperature in °F

- Use on inlet to limit need to correct for high pressure or elevated outlet temperature
- Standard model limits = 140°F and 30 PSIG

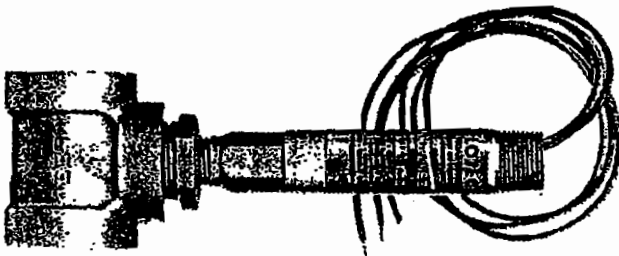
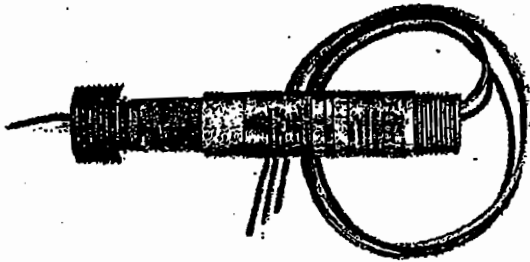
HOW IT WORKS



Rotron's flow meter is a venturi style design. After air enters the inlet, the pressure is measured in the T1 tap. The second tap, T2, measures the pressure at the throat. The differential between T1 and T2 registers across a special calibrated CFM gauge to provide accurate readings. The throat is then expanded back to the original size to keep pressure loss to under 2-4 IWG.

Rev. 2/01

Installation and Operating Instructions



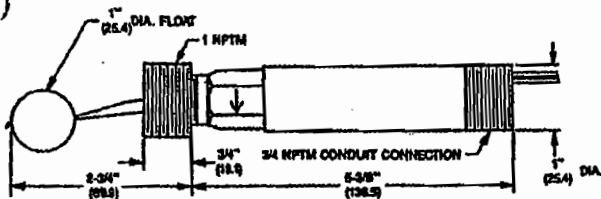
Bel	Brass	Bronze	Ceramic	Polypropylene	301SS	303SS	304SS
B-S3-A	X		X		X		X
B-S3-B	X	X	X	X	X		
B-S3-C	X		X		X		X
B-S3-H	X	X	X		X		X
B-S3-O	X		X	X	X		
B-S3-A			X	X	X		X
B-S3-C			X		X	X	X
B-S3-L			X		X	X	X
B-S3-O			X	X	X	X	
B-S3-S			X	X	X	X	

For units supplied with both internal and external grounds, the ground screw inside the housing must be used to ground the control. The

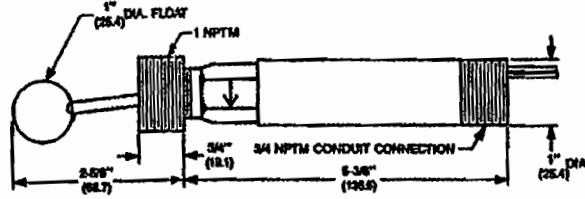
Model Number	Float	Pressure Rating PSIG (KG/CM ²)
L6EPB-B-S-3-A	Cylindrical SS	200 (14)
L6EPB-B-S-3-B	Polypropylene	250 (18)
L6EPB-B-S-3-C	Round SS	350 (25)
L6EPB-B-S-3-H	Round SS	250 (18)
L6EPB-B-S-3-O	Polypropylene	1000 (70)
L6EPB-S-S-3-A	Cylindrical SS	200 (14)
L6EPB-S-S-3-C	Round SS	350 (25)
L6EPB-S-S-3-L	Round SS	350 (25)
L6EPB-S-S-3-O	Polypropylene	2000 (140)
L6EPB-S-S-3-S	Polypropylene	2000 (140)

Dimensions on reverse

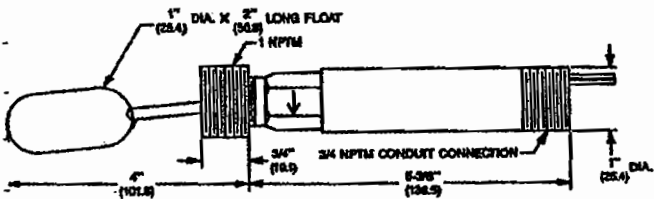
FLOTECT. MODEL L-6 FLOAT SWITCH — DIMENSION DRAWINGS



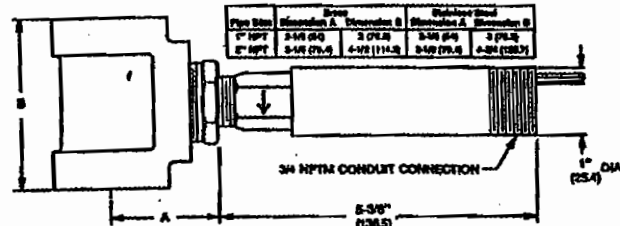
Polypropylene Float



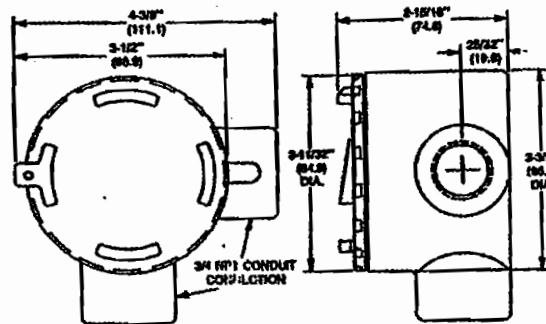
Round Stainless Steel Float



Cylindrical Stainless Steel Float



With External Float Chamber (Tee)



CSA, CENELEC Conduit Enclosure

Limited Warranty: The Seller warrants all Dwyer instruments and equipment to be free from defects in workmanship or material under normal use and service for a period of one year from date of shipment. Liability under this warranty is limited to repair or replacement F.O.B. factory of any parts which prove to be defective within that time or repayment of the purchase price at the Seller's option provided the instruments have been returned, transportation prepaid, within one year from the date of purchase. All technical advice, recommendations and services are based on technical data and information which the Seller believes to be reliable and are intended for use by persons having skill and knowledge of the business, at their own discretion. In no case is Seller liable beyond replacement of equipment F.O.B. factory or the full purchase price. This warranty does not apply if the maximum ratings label is removed or if the instrument or equipment is abused, altered, used at ratings above the maximum specified, otherwise misused in any way.

THIS EXPRESS LIMITED WARRANTY IS IN LIEU OF AND EXCLUDES ALL OTHER REPRESENTATIONS MADE BY ADVERTISEMENTS OR BY AGENTS AND ALL OTHER WARRANTIES, BOTH EXPRESS AND IMPLIED. THERE ARE NO IMPLIED WARRANTIES OF MERCHANTABILITY OR OF FITNESS FOR A PARTICULAR PURPOSE FOR GOODS COVERED HEREUNDER.

Remedies: THE BUYER'S EXCLUSIVE AND SOLE REMEDY ON ACCOUNT OF OR IN RESPECT TO THE FURNISHING OF NONCONFORMING OR DEFECTIVE MATERIAL SHALL BE TO SECURE REPLACEMENT THEREOF AS AFORESAID. THE SELLER SHALL NOT IN ANY EVENT BE LIABLE FOR THE COST OF ANY LABOR EXPENDED ON ANY SUCH MATERIAL OR FOR ANY SPECIAL, DIRECT OR CONSEQUENTIAL DAMAGES TO ANYONE BY REASON OF THE FACT THAT IT SHALL HAVE BEEN NON-CONFORMING OR DEFECTIVE.





ROTRON TECHNICAL MOTOR DIVISION
REGENERATIVE BLOWER GROUP

75 North Street
Saugerties, New York 12477
Phone: (914) 246-3401
Fax: (914) 246-3802

OPERATION & MAINTENANCE MANUAL

Rotron Moisture Separator

Thank you for purchasing an AMETEK Rotron MS series moisture separator. When matched with the correct Rotron blower, and properly installed and maintained, this separator will effectively and efficiently remove moisture from the air stream. To ensure good results, please take the time to read these instructions before starting the installation of your moisture separator.

Sizing for Optimal Efficiency

Separator	Max. CFM	Max. Vac	Capacity	Blowers
MS200P(S)	200	12" IHg	7 gal.	EN101-EN555, EN513, EN523, EN623
MS200D(S)	200	22 IHg	10 gal.	EN101-EN555, EN513, EN523, EN623
MS300P(S)	300	12" IHg	7 gal.	EN606, EN6, EN707, EN823
MS300D(S)	300	22 IHg	10 gal.	EN606, EN6, EN707, EN823
MS350B(S)	350	22 IHg	40 gal.	EN808, EN1223
MS500B(S)	500	22 IHg	40 gal.	EN858
MS600B(S)	600	22 IHg	40 gal.	EN909
MS1000B(S)	1000	22 IHg	65 gal.	EN14

Note: "S" suffix denotes presence of XP high level switch.

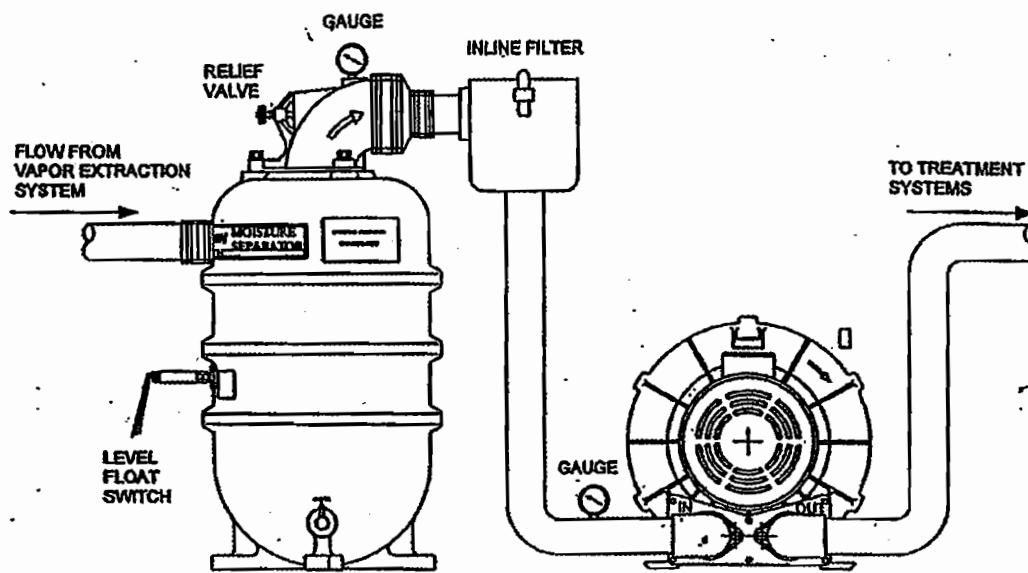
* Special Construction with 20 IHg capability available.

Installation

- Unpacking** - For MS200/300, remove drain valve taped to packing material and box containing liquid level switch, if so equipped. For MS350/500/600, remove box containing valve hardware as well as box containing liquid level switch (if so equipped) and remove internal cardboard packaging and cable ties from screen assembly.
- Bolt Down (w/ feet included)** - For MS200/300 models, built-in feet or a mounting ring is included. It is recommended that these units be bolted in place. All models will only work in an upright position.
- Piping** - Attach to system piping with flexible couplings to minimize stress incurred by rigid system piping. The connections should be airtight but not sealed with an adhesive for ease of disassembly during routine maintenance. Install drain valve, using teflon tape on threads.
- Installation and Wiring of Liquid Level Switch** - Remove plug from the bulkhead fitting. Thread the switch by hand until snug with index arrow pointing down. Wire in accordance with the nameplate wiring schematic. Typically, the wiring is connected back to the starter to shut down the system but can be used for other purposes.
- Install/Adjust Relief Valve** - For MS500/600, first install the relief valve with teflon tape on threads. Use a wrench, but tighten only enough to prevent leakage. Next step for all MS units, back off the relief valve adjuster relaxing spring pressure. Then block the moisture separator inlet while measuring the motor current. Adjust the valve until the motor current is 90% of the max. nameplate blower amps.
- Continuous Service** - For cold weather service, appropriate steps should be taken to prevent freezing. Also, the maximum vacuum ratings are based on 115°F maximum. Consult factory for higher potential ambients.

Note: A moisture separator is not a substitute for an inline air filter. A Rotron inline filter should be used to remove particles that pass through the separator.

Typical Vapor Extraction System



Operation

Moisture-laden air enters the separator through the tangential inlet. Cyclonic action removes free moisture from the air stream and allows the air to discharge through the top of the separator. When the separator is full, the float valve shuts off the air flow through the separator, and the relief valve opens to limit the vacuum of the blower.

To drain the separator, turn off the blower and open the drain valve at the bottom of the separator. **Caution:** The liquid contained in the separator should be analyzed before it is released back into the environment. It may be considered hazardous waste in certain geographical areas and require special treatment/disposal. Once the liquid is drained, the unit can be reset by turning the blower back on.

Automatic draining options are at the discretion of the customer.

Maintenance

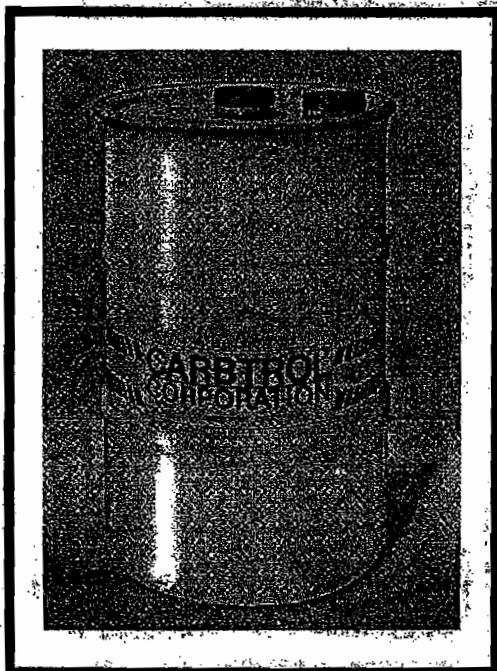
This MS series moisture separator has been designed to require minimal maintenance. During normal operation a layer of sludge may build up on the bottom of the separator. As necessary, the top assembly of the moisture separator should be removed and the inside cleaned out with water. Keeping the inside clean will prevent the valve from becoming clogged with sediment. The relief valve should be inspected upon emptying the separator and readjusted (per installation instruction 5) upon restart.

If you have any questions regarding this product, contact your local sales representative or our Application Engineering Department at the factory.

CARBOTROL®

AIR PURIFICATION CANISTERS 140-200 LB. ACTIVATED CARBON

G-1
G-2
G-3



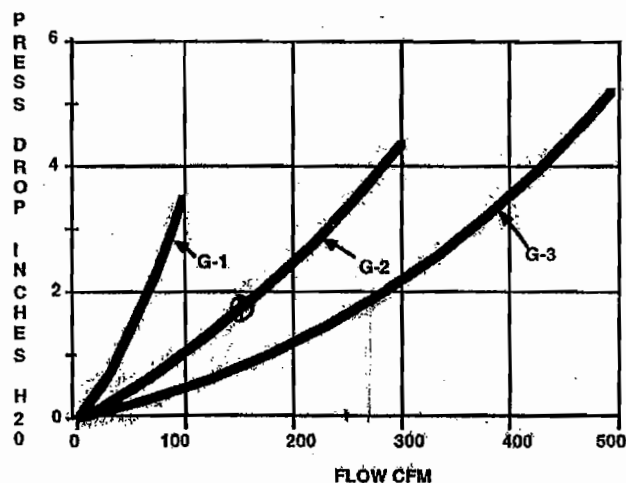
The CARBOTROL "G" Canisters handles flows up to 500 CFM.

FEATURES

- High activity carbon.
- Epoxy lined steel or polyethylene construction.
- Acceptable for transport of hazardous spent carbon.
- Side drain for removal of accumulated condensate.
- Low pressure drop.
- PVC internal piping.
- High temperature (180°F) steel units available.

APPLICATIONS

- Soil vapor remediation
- Air stripper exhausts
- Tank vents
- Exhaust hoods
- Work area purification
- Sewage plant odor control



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AT-116/#1

CARBOTROL®
CORPORATION

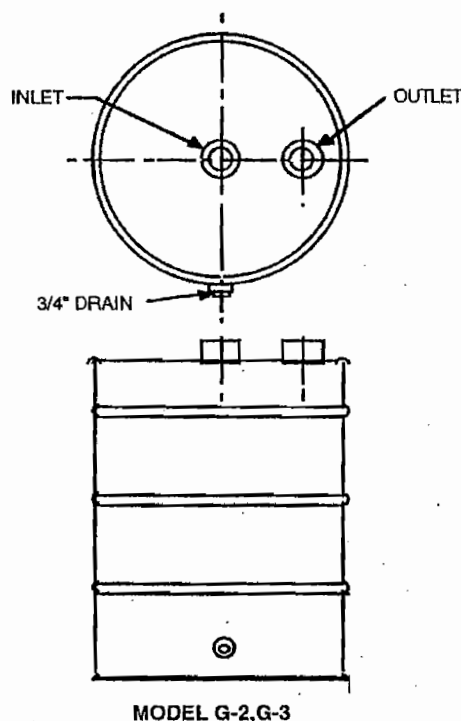
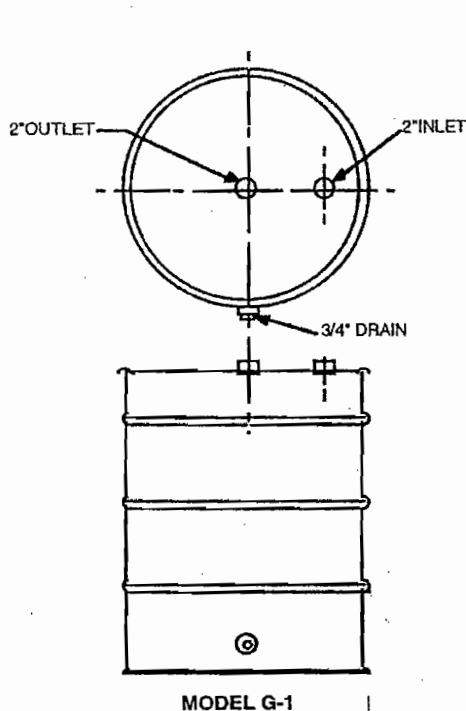
51 Riverside Avenue
Westport, CT 06880

1-800-242-1150 • Fax # (203) 226-5322
Web Address: <http://www.carbtrol.com>

CARBTROL®

AIR PURIFICATION CANISTERS 140-200 LB. ACTIVATED CARBON

G-1
G-2
G-3



SPECIFICATIONS

MODEL	DIAMETER/HEIGHT	CARBON WEIGHT	INLET/OUTLET	MAXIMUM RATED FLOW	APPROXIMATE SHIP WEIGHT
G-1*	24"/36"	200 lbs.	2"/2"	100 CFM	240 lbs.
→ G-2*(STEEL)	24"/36"	170 lbs.	4"/4"	300 CFM	210 lbs.
G-3P	24"/36"	140 lbs.	6"/6"	500 CFM	180 lbs.
G-3S	24"/34"	140 lbs.	4"/4"	500 CFM	180 lbs.

* Specify: Polyethylene (P) or Epoxy Lined Steel (S)

SAFETY

Certain chemical compounds in the presence of activated carbon may oxidize, decompose or polymerize. This could result in temperature increases sufficient to cause ignition of the activated carbon or adsorbed material. If a compounds reaction with activated carbon is unknown, appropriate tests should be considered.

CARBTROL®
CORPORATION

51 Riverside Avenue
Westport, CT 06880

1-800-242-1150 • Fax # (203) 226-5322
Web Address: <http://www.carbtrol.com>

Stoddard Silencers, Inc.

1017 Progress Drive • Grayslake, Illinois 60030

Telephone (847) 223-8636 • FAX (847) 223-8638

E-Mail - info @ stoddardsilencersinc.com

Web page - www.stoddardsilencersinc.com

Application

Blower Discharge Silencer for maximum silencing at blower speeds below transition speed.

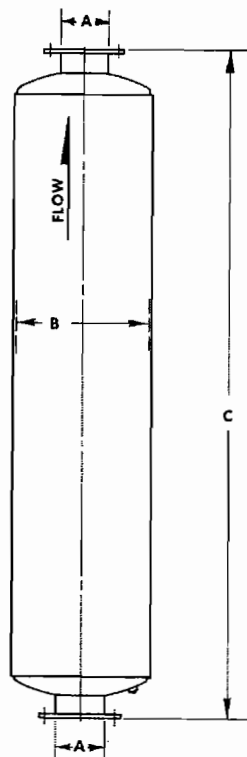
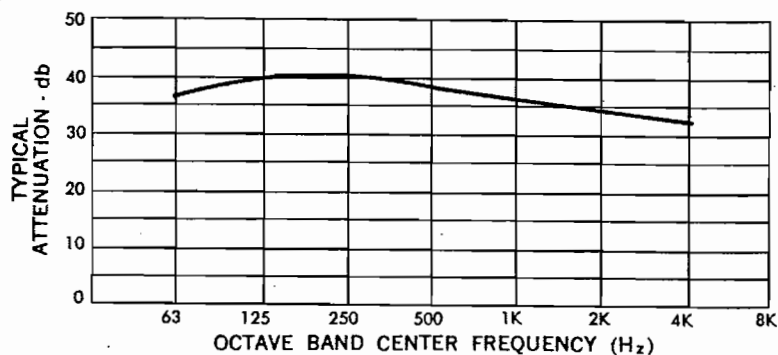
Design

A multi-chambered silencer containing a special arrangement of volumes and air passage-ways to effectively reduce pulsations through the conversion of noise energy into heat. D13 and D13H Silencers may be installed horizontally or vertically. Design parameters permit nozzle orientation to suit installation requirements.

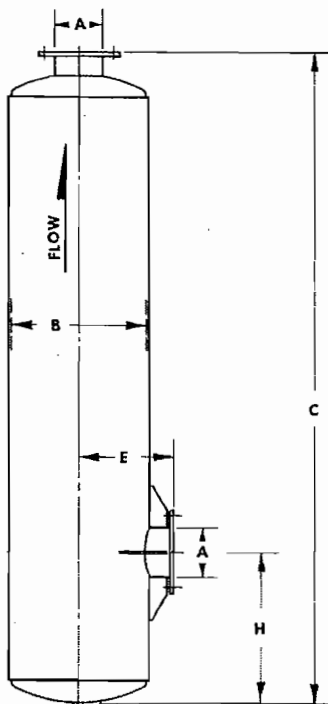
Construction

All welded steel sheet and plate construction for long service life. Exterior surfaces are prime coated. Flanges are drilled to match 125 lb. American Standard Flanges. Inspection opening, mounting brackets, relief valve nozzles or special paint available at extra charge.

Typical Attenuation Curve



D13



D13H

Model	A	B	C	Wt.
D13- 1	1"	4½"	21	7
D13- 1½	1½"	6½"	24	14
D13- 2	2"	8"	33	23
D13- 2½	2½"	10"	33	36
D13- 3	3"	10"	51	45
D13- 3½	3½"	12"	52	65
D13- 4	4**	14"	53	125
D13- 5	5**	16"	65	145
D13- 6	6**	18"	72	175
D13- 8	8"	22"	92	465
D13-10	10"	26"	117	748
D13-12	12"	30"	130	1158
D13-14	14"	36"	162	1737
D13-16	16"	42"	176	2353
D13-18	18"	48"	183	3022
D13-20	20"	48"	195	3582
D13-22	22"	54"	208	4815
D13-24	24"	54"	226	5963

*NPT Connections

**Available in both NPT or Flange Connections

3'-7" H₂O

Model	A	B	C	E	H		Wt.
					Min.	Max.	
D13H- 2	2"	8"	30	7	6	10	25
D13H- 2½	2½"	10"	31	8	6	10	36
D13H- 3	3"	10"	49	8	6	10	45
D13H- 4	4**	14"	49	11	7	24	125
D13H- 5	5**	16"	62	12	8	28	145
D13H- 6	6"	18"	68	13	9	34	175
D13H- 8	8"	22"	89	15	10	43	465
D13H-10	10"	26"	114	17	12	57	748
D13H-12	12"	30"	127	19	13	69	1158
D13H-14	14"	36"	159	22	15	69	1737
D13H-16	16"	42"	173	25	17	81	2353
D13H-18	18"	48"	180	28	19	90	3022
D13H-20	20"	48"	192	28	20	92	3582
D13H-22	22"	54"	205	31	22	96	4815
D13H-24	24"	54"	223	31	24	100	5963



**Where The Best Is
In Store for You!**

INLET VACUUM AIR FILTERS

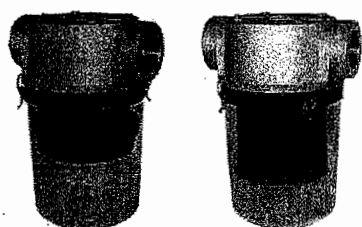
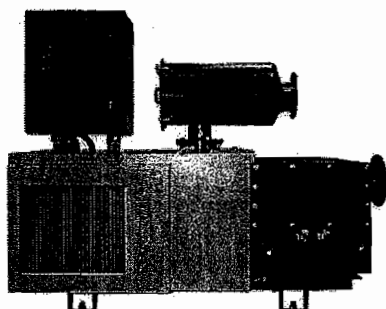
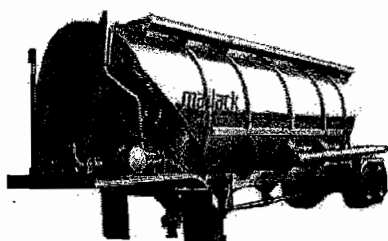
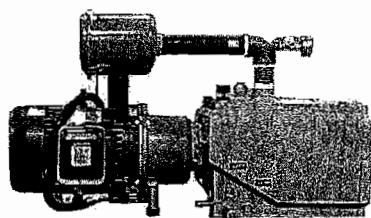


TABLE OF CONTENTS

VACUUM FILTERS: L-configuration filters (Side-In, Bottom Out-for easy element access) designed for full flow, low pressure drop and high filtration efficiency. Vacuum tight for maximum equipment performance. Industrial, Severe, & Extreme duty models in stock. Stainless Steel filters available.

- **CSL Series:**
 - Small Compact 3/8" to 3" FPT pg. 2
 - Mid-Size 3" to 6" MPT pg. 3
 - 4" to 6" FLG pg. 4
 - Large 8" to 12" FLG pg. 5

COMPACT VACUUM FILTERS: T-style filters (Straight Through Horizontal) designed with easy element access. Captured particulate drops to bottom eliminating system contamination during element change out. Industrial, Severe & Extreme duty models in stock.

- **CT Series: Compact Design** 2" to 6" FPT pg. 6
- **SpinMeister Vacuum Filters: Extreme Duty Filtration** 2" to 4" FPT pg. 7

VACUUM FILTERS: Compact vacuum filters with both L-style and T-style configurations. Available in both Stainless Steel and epoxy coated assemblies and with optional extended holding capacity

- **VL Series: Compact Design/Extreme Duty "L" Style** 3" to 6" MPT, 4" to 6" FLG pg. 8
- **VS Series: Compact Design/Extreme Duty "T" Style** 3" to 6" MPT, 4" to 6" FLG pg. 9

INTEGRATED LIQUID SEPARATOR/VACUUM FILTER: Simplify package and reduce footprint while maintaining high efficiency filtration.

- **LRS Series** pg. 10

REPLACEMENT PARTS/ACCESSORIES pg. 11

REPLACEMENT ELEMENTS pg. 12

INLET VACUUM FILTERS
CSL, CT, VL, VS, LRS Series

Bulletin VF-151



SMALL COMPACT INLET VACUUM FILTERS

"CSL" Series 3/8" - 3" FPT

APPLICATIONS & EQUIPMENT

- Vacuum Pumps & Systems – P.D., Side Channel, Rotary Vane, Screw, Piston
- Vacuum Packaging Equipment
- Vacuum Lifters
- Blowers - Side Channel & P.D.
- Intake Suction Filters
- Pneumatic Conveying Systems
- Soil Venting/Remediation
- Remote Installations for Piston & Screw Compressors
- Printing Industry
- Factory Automation Equip
- Leak Detection Systems
- Woodworking
- Medical Industry

FEATURES & SPECIFICATIONS

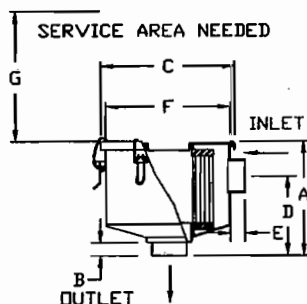
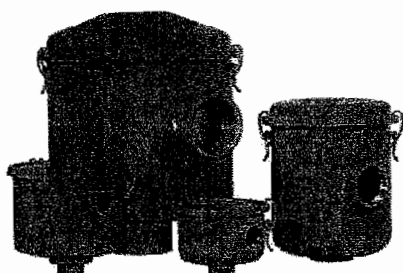
- **Vacuum level:** Typically 1×10^{-3} mmHg (1.3×10^{-3} mbar)
- Polyester: 99%+ removal efficiency standard to 5 micron
- Paper: 99%+ removal efficiency standard to 2 micron
- Brazed fittings for **High** vacuum duty
- Stainless steel torsion clips for durability
- Low pressure drop
- Positive engagement O-ring seal system
- Seamless drawn housings
- **Large** dirt holding capacity and **Easy** field cleaning, especially when mounted horizontally or inverted
- Rugged all steel construction w/baked enamel finish
- Various media
- Temp (continuous): min -15°F (-26°C) max 220°F (104°C)
- Filter change out differential: 10" - 15" H₂O over initial delta P
- Pressure drop graphs available upon request

OPTIONS (Inquiries Encouraged)

- Vacuum gauge available
- Dome hood for high holding capacity
- Available in **Stainless Steel**
- Epoxy coated housings
- Activated carbon prefilter for odor
- Support brackets
- Alternate top-to-canister fastening system for low pressure or pulsating systems

CONFIGURATION

DRAWING



Dimension tolerance $\pm 1/4"$

I = Industrial Duty S = Severe Duty

	with Polyester Element	with Paper Element	FPT Inlet & Outlet	DIMENSIONS - inches							Rated Flow SCFM	Rated Flow SCFM	Approx. Wt. lbs
				A	B	C	D	E	F	G	Nominal Rating	Element Rating	
I	CSL-825-038HC	CSL-824-038HC	3/8"	3 5/8	9/16	3 3/4	1 7/8	9/16	3 1/2	3	18	25	0.88
I	CSL-825-050HC	CSL-824-050HC	1/2"	3 5/8	9/16	3 3/4	1 7/8	9/16	3 1/2	3	18	25	0.88
I	CSL-843-050HC	CSL-842-050HC	1/2"	4 3/8	9/16	5 7/8	2 1/2	9/16	5	3 1/4	20	55	3
I	CSL-843-075HC	CSL-842-075HC	3/4"	5 3/4	9/16	5 7/8	2 1/2	9/16	5	3 1/4	24	55	3
S	CSL-843-075HC	CSL-842-075HC	3/4"	4 3/8	9/16	5 7/8	2 1/2	9/16	5	3 1/4	24	55	3
I	CSL-843-100HC	CSL-842-100HC	1"	6 1/2	3/4	7 5/8	4 1/4	3/4	6 13/16	5 1/4	40	115	5
S	CSL-843-100HC	CSL-842-100HC	1"	6 1/2	3/4	7 5/8	4 1/4	3/4	6 13/16	5 1/4	40	115	5
I	CSL-843-125HC	CSL-842-125HC	1 1/4"	6 1/2	3/4	7 5/8	4 1/2	3/4	6 13/16	5 1/4	60	115	5
S	CSL-843-125HC	CSL-842-125HC	1 1/4"	6 1/2	3/4	7 5/8	4 1/2	3/4	6 13/16	5 1/4	60	115	5
I	CSL-849-150HC	CSL-848-150HC	1 1/2"	6 1/2	3/4	7 5/8	4 1/2	3/4	6 13/16	5 1/4	80	115	5
I	CSL-849-150HC	CSL-848-150HC	1 1/2"	6 1/2	3/4	7 5/8	4 1/2	3/4	6 13/16	5 1/4	80	115	5
I	CSL-851-200HC	CSL-850-200HC	2"	10 1/2	1 1/4	13 1/4	6 1/2	1 1/4	12 1/2	10	240	570	33
I	CSL-851-250HC	CSL-850-250HC	2 1/2"	10 1/2	1 1/4	13 1/4	6 1/2	1 1/4	12 1/2	10	240	570	33
I	CSL-289-300HC	CSL-288-300HC	3"	15 3/4	2 7/8	19 1/4	8 3/8	2 7/8	17 1/2	12	300	570	33

*1/4" taps standard on inlet and outlet

Note: Model offerings and design parameters may change without notice.

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CSL14-306



INLET VACUUM FILTERS

"CSL" Series 3" - 6" MPT

APPLICATIONS & EQUIPMENT

- Vacuum Pumps & Systems – P.D., Side Channel, Rotary Vane, Screw, Piston
- Vacuum Packaging Equipment
- Vacuum Furnaces
- Blowers - Side Channel & P.D.
- Intake Suction Filters
- Pneumatic Conveying Systems
- Remote Install for Piston, Screw & Centrifugal Compressors
- Factory Automation Equip
- Ash Handling
- Food Industry
- Paper Processing
- Glass, Ceramic Processing
- Waste Water Treatment
- Woodworking
- Cement
- Bag House Systems
- Envelope Manufacturing
- Medical Industry
- Chemical Processing

FEATURES & SPECIFICATIONS

- **Vacuum level:** Typically 1×10^{-3} mmHg (1.3×10^{-3} mbar)
- Polyester: 99%+ removal efficiency standard to 5 micron
- Paper: 99%+ removal efficiency standard to 2 micron
- Heavy duty T bolts for easy maintenance
- Hydrostatically tested to 0.5 bar pressure for vacuum tightness
- Low pressure drop
- Positive engagement O-ring seal system
- **Large** dirt holding capacity and **Easy** field cleaning, especially when mounted horizontally or inverted
- Inlet/outlet 1/4" gauge taps standard
- Rugged all steel construction w/baked gray enamel finish
- Temp (continuous): min -15°F (-26°C) 220°F (max 104°C)
- Filter change out differential: 10" - 15" H₂O over initial delta P
- Pressure drop graphs available upon request

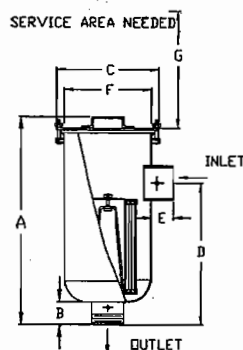
OPTIONS (Inquiries Encouraged)

- Various media
- Larger sizes available
- Straight-Through Configurations
- Available in **Stainless Steel**
- Epoxy coated housings
- Support brackets
- Special connections
- Activated carbon prefilters to reduce order

CONFIGURATION



DRAWING



Dimension tolerance $\pm 1/4"$

INLET VACUUM FILTERS
CSL, CT, VL, VS, LRS Series

I = Industrial Duty S = Severe Duty E = Extreme Duty

			MPT Inlet & Outlet	DIMENSIONS - inches							Rated Flow SCFM		Approx. Wt. lbs
				A	B	C	D	E	F	G	Nominal Rating	Element Rating	
I	CSL-235P-300	CSL-234P-300	3"	27 1/8	3	14	18 1/2	3	12	10	300	570	47
S	CSL-335P-300	CSL-334P-300	3"	27 1/8	3	14	18 1/2	3	12	15	300	800	50
I	CSL-235P-400	CSL-234P-400	4"	27 1/8	3	14	18 1/2	3	12	10	520	570	52
S	CSL-335P-400	CSL-334P-400	4"	27 1/8	3	14	18 1/2	3	12	15	520	800	55
S	CSL-235P-500	CSL-234P-500	5"	28 1/8	3	18 1/2	19 1/2	3	16	10	800	800	82
S	CSL-345P-500	CSL-344P-500	5"	28 1/8	3	18 1/2	19 1/2	3	16	15	800	1100	88
I	CSL-275P-600	CSL-274P-600	6"	29 1/8	4	18 1/2	20 1/2	4	16	10	1100	1100	95
S	CSL-375P-600	CSL-374P-600	6"	29 1/8	4	18 1/2	20 1/2	4	16	15	1100	1500	97

Note: Model offerings and design parameters may change without notice.

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CSL24-306



INLET VACUUM FILTERS

"CSL" Series 4" - 6" 125/150# Pattern Flange

APPLICATIONS & EQUIPMENT

- Vacuum Pumps & Systems – P.D., Side Channel, Rotary Vane, Screw, Piston
- Vacuum Packaging Equipment
- Vacuum Furnaces
- Blowers - Side Channel & P.D.
- Intake Suction Filters
- Pneumatic Conveying Systems
- Remote Install for Piston, Screw & Centrifugal Compressors
- Factory Automation Equip
- Ash Handling
- Food Industry
- Paper Processing
- Glass, Ceramic Processing
- Waste Water Treatment
- Woodworking
- Cement
- Bag House Systems
- Envelope Manufacturing
- Medical Industry
- Chemical Processing

FEATURES & SPECIFICATIONS

- **Vacuum level:** Typically 1×10^{-3} mmHg (1.3×10^{-3} mbar)
- Polyester: 99%+ removal efficiency standard to 5 micron
- Paper: 99%+ removal efficiency standard to 2 micron
- Heavy duty T bolts for easy maintenance
- Hydrostatically tested to 0.5 bar pressure for vacuum tightness
- Low pressure drop
- Positive engagement O-ring seal system
- **Large dirt holding capacity and Easy field cleaning,** especially when mounted horizontally or inverted
- Inlet/outlet 1/4" gauge taps standard
- Rugged all steel construction w/baked gray enamel finish
- Temp (continuous): min -15°F (-26°C) max 220°F (104°C)
- Filter change out differential: 10" - 15" H₂O over initial delta P
- Pressure drop graphs available upon request

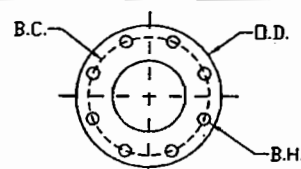
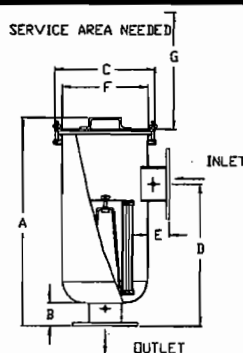
OPTIONS (Inquiries Encouraged)

- Various media
- Larger sizes available
- Straight-Through Configurations
- Available in **Stainless Steel**
- Epoxy coated housings
- Support brackets
- Special connections
- Activated carbon prefilters to reduce order

CONFIGURATION



DRAWING



Flange Orientation

Note: All side inlet to outlet flanges are orientated "split center".

Dimension tolerance $\pm 1/4"$

I = Industrial Duty S = Severe Duty E = Extreme Duty

	with Polyester Element	with Paper Element	Flg Inlet & Outlet	DIMENSIONS - inches							Rated Flow SCFM		Approx. Wt. lbs
				A	B	C	D	E	F	G	Nominal Rating	Element Rating	
I	CSL-235P-400F	CSL-234P-400F	4"	27 1/8	3	14	18 1/2	3	12	15	520	570	62
S	CSL-335P-400F	CSL-334P-400F	4"	27 1/8	3	14	18 1/2	3	12	20	520	800	64
I	CSL-245P-600F	CSL-244P-600F	5"	28 1/8	3	18 1/2	19 1/2	3	16	15	800	880	88
S	CSL-345P-600F	CSL-344P-600F	5"	28 1/2	3	18 1/2	19 1/2	3	16	20	800	1100	90
I	CSL-275P-600F	CSL-274P-600F	6"	28 1/8	4	18 1/2	20 1/2	4	16	15	1100	1100	110
S	CSL-375P-600F	CSL-374P-600F	6"	28 1/8	4	18 1/2	20 1/2	4	16	20	1100	1500	113

125/150# Pattern Flg	DIMENSIONS - inches			No. of Holes	Flange Thickness
	O.D.	B.C.	B.H.		
4"	9	7 1/2	0.75	8	0.38
5"	10	8 1/2	0.88	8	0.38
6"	11	9 1/2	0.88	8	0.38

Note: Model offerings and design parameters may change without notice.

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CSL34-306



INLET VACUUM FILTERS

"CSL" Series 8" - 12" 125/150# Pattern Flange

APPLICATIONS & EQUIPMENT

- Vacuum Pumps & Systems – P.D., Side Channel, Rotary Vane, Screw, Piston
- Vacuum Packaging Equipment
- Vacuum Furnaces
- Blowers - Side Channel & P.D.
- Intake Suction Filters
- Pneumatic Conveying Systems
- Remote Install for Piston, Screw & Centrifugal Compressors
- Factory Automation Equip
- Ash Handling
- Food Industry
- Paper Processing
- Glass, Ceramic Processing
- Waste Water Treatment
- Woodworking
- Cement
- Bag House Systems
- Envelope Manufacturing
- Chemical Processing

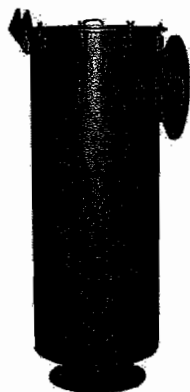
FEATURES & SPECIFICATIONS

- **Vacuum level:** Typically 1×10^{-3} mmHg (1.3×10^{-3} mbar)
- Polyester: 99%+ removal efficiency standard to 5 micron
- Paper: 99%+ removal efficiency standard to 2 micron
- Heavy duty T bolts for easy maintenance
- Hydrostatically tested to 0.5 bar pressure for vacuum tightness
- Low pressure drop
- Positive engagement O-ring seal system
- **Large dirt holding capacity and Easy field cleaning,** especially when mounted horizontally or inverted
- Inlet/outlet 1/4" gauge taps standard
- Rugged all steel construction w/baked gray enamel finish
- Temp (continuous): min -15°F (-26°C) max 220°F (104°C)
- Filter change out differential: 10" - 15" H₂O over initial delta P
- Pressure drop graphs available upon request

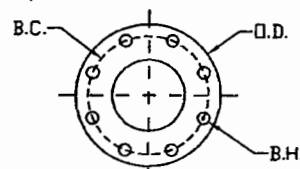
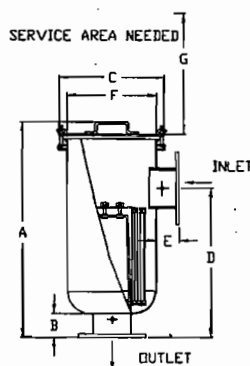
OPTIONS (Inquiries Encouraged)

- Various media
- Larger sizes available
- Straight-Through Configurations
- Available in **Stainless Steel**
- Epoxy coated housings
- Support brackets
- Special connections
- Activated carbon prefilters to reduce order

CONFIGURATION



DRAWING



Flange Orientation

Note: All side inlet to bottom outlet flanges are orientated "split center".

Dimension tolerance $\pm 1/4"$

I = Industrial Duty S = Severe Duty E = Extreme Duty

	with Polyester Element	with Paper Element	Flg Inlet & Outlet	DIMENSIONS - inches							Rated Flow SCFM		Approx Wt. lbs
				A	B	C	D	E	F	G	Nominal Rating	Element Rating	
I	CSL-377P-800F	CSL-376P-800F	8"	38	4	22 1/2	25 1/2	4	20	20	1800	1825	185
S	CSL-385P-1000F	CSL-384P(2)-1000F	10"	57 1/2	4	25 7/16	45	4	23	23	2900	2800	380
S	CSL-485P(2)-1200F	CSL-484P(2)-1200F	12"	69 1/2	4	26 7/16	57	4	24	25	4950	9410	465

125/150# Pattern Flg	DIMENSIONS - inches			No. of Holes	Flange Thickness
	O.D.	B.C.	B.H.		
8"	13 1/2	11 3/4	0.88	8	0.38
10"	16	14 1/4	1	12	0.38
12"	19	17	1	12	0.5

Note: Model offerings and design parameters may change without notice.

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CSL44-306



COMPACT "T" STYLE INLET VACUUM FILTERS

"CT" Series 2" – 6" FPT



APPLICATIONS & EQUIPMENT

- Vacuum Pumps & Systems – P.D., Side Channel, Rotary Vane, Screw, Piston
- Vacuum Packaging Equipment
- Vacuum Furnaces
- Blowers - Side Channel & P.D.
- Remote Install for Piston, Screw & Centrifugal Compressors
- Factory Automation Equip
- Ash Handling
- Pneumatic Conveying Systems
- Food Industry
- Paper Processing
- Glass, Ceramic Processing
- Waste Water Treatment
- Woodworking
- Cement
- Bag House Systems
- Envelope Manufacturing
- Medical Industry
- Chemical Processing

FEATURES & SPECIFICATIONS

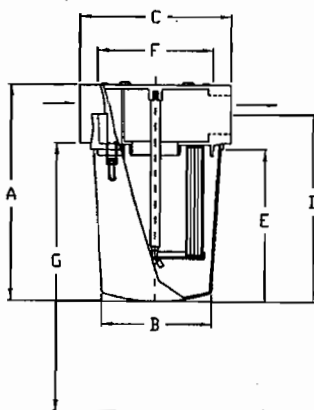
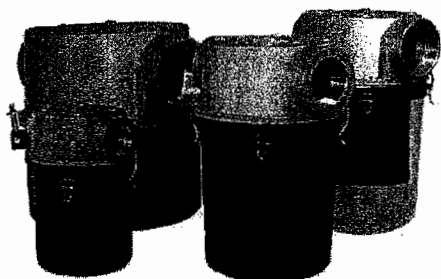
- **Vacuum level:** Typically 1×10^{-3} mmHg (1.3×10^{-3} mbar)
- **Compact** design for space restrictions; min. service area
- Inlet is above the element to **Extend** element life and maintenance intervals
- Cast aluminum top (resists corrosion) with machined connections has an **Integrated Baffle** design
- "T" style design **Minimizes** piping requirements
- 1/4" differential gauge ports standard
- Durable black carbon steel buckets
- "Drop-Down" housing for easy servicing and dirt containment
- Casting has 4 unthreaded tap holes for mounting bracket
- Low pressure drop and Positive Sealing assembly
- Temp (continuous): min -15°F (-26°C) max 220°F (104°C)
- Filter change out differential: 10"-15" H₂O over initial delta P
- Swing Bolts on 5" & 6" sizes standard

OPTIONS (Inquiries Encouraged)

- **New See-Through Buckets for 3" and 4" Sizes**
- Extreme duty configuration
- Special connections
- Activated carbon prefilters to reduce order
- Swing Bolts available for all sizes
- Epoxy coated housings
- Various media

CONFIGURATION

DRAWING



I = Industrial Duty S = Severe Duty E = Extreme Duty

Dimension tolerance $\pm 1/4"$

		with Polyester Element	with Paper Element	FPT Inlet & Outlet	DIMENSIONS - inches							Rated Flow SCFM Nominal Rating	Element Rating	Approx. Wt. lbs
					A	B	C	D	E	F	G			
NEW SIZE	I	CT-851-200C	CT-850-200C	2"	13	7 5/8	9	10 7/8	9	5 5/8	18	175	290	16
	I	CT-851-250C	CT-850-250C	2-1/2"	13	7 5/8	9	10 7/8	9	5 5/8	18	210	290	15
	I	ST-235P-300C	ST-234P-300C	3"	19 7/8	9 7/8	13 1/2	17 1/8	14	10	25	300	570	29
NEW	I	CT-235P-400C	CT-234P-400C	4"	18 7/8	9 7/8	13 1/2	16 1/8	13	10	25	520	570	26
	I	CT-235P-500C	CT-234P-500C	5"	18 1/4	16	19	14 3/8	9 7/8	14 3/4	20	800	1100	50
	I	CT-235P-600C	CT-234P-600C	6"	18 1/4	16	19	14 3/8	9 7/8	14 3/4	20	1100	1100	45
NEW SIZE	I	CT-235P-400C	CT-234P-400C	4"	18 7/8	9 7/8	13 1/2	16 1/8	13	10	25	520	570	26
	S	CT-275P-500C	CT-274P-500C	5"	18 1/4	16	19	14 3/8	9 7/8	14 3/4	20	800	1100	50
	I	CT-275P-600C	CT-274P-600C	6"	18 1/4	16	19	14 3/8	9 7/8	14 3/4	20	1100	1100	45

Note: Model offerings and design parameters may change without notice.

"ST" denotes New See-Through bucket option

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EXTREME DUTY FILTRATION INLET VACUUM FILTERS SPINMEISTER™ /Dual "T" Style



APPLICATIONS & EQUIPMENT – Extreme Duty Environments

- Screw Compressors
- Woodworking/Router Tables
- Vacuum Systems
- Plastics
- Material Handling Systems
- Pneumatic Conveying Systems
- Food Processing

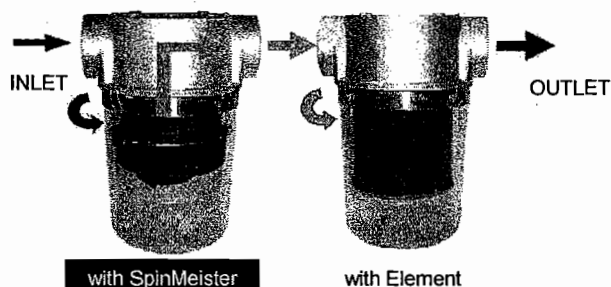
FEATURES & SPECIFICATIONS

- **Extreme Duty Filtration** for high dust environments
- **Significantly Increases** the life of the filter element
- The centrifugal force from the intake air causes the particulate to separate from the air stream, forcing it to the outer cover perimeter and out through the discharge port.
- SpinMeister™ Precleaner - 85+% efficient up to 15 microns
 - Made of durable molded fiber filled composite material
 - Integrated SpinMeister has reduced pressure drop and eliminates large objects from entering air stream.
- The air stream then enters the **Inlet Filter** and is filtered by a 99+% efficient pleated element
- **See-Through Buckets** for 3" and 4" connections
 - **Significant** dirt holding capacity
 - Clip release shell for Easy maintenance
- Durable black carbon steel buckets for all sizes: 2" to 6" connections
- Polyester: 99%+ removal efficiency standard to 5 micron
- Paper: 99%+ removal efficiency standard to 2 micron
- Positive sealing assembly
- Temp (continuous): min -15°F (-26°C) max 220°F (104°C)

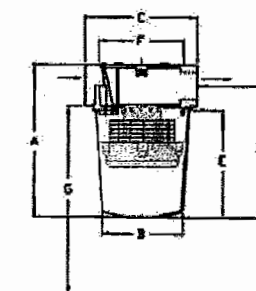
OPTIONS (Inquiries Encouraged)

- Multiple Configurations
 - Inlet "L" Design Filters
 - Inlet Filter Assemblies
- SpinMeisters™ available in Polished Aluminum
- VS and VL Series Models
- Larger systems available
Ask about CT 5" & 6" sizes
- Swing Bolts available for all sizes

CONFIGURATION

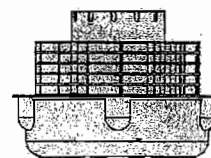


DRAWING



Dimension tolerance $\pm 1/4"$

SCHEMATIC



SpinMeister™
Patent Pending

INLET VACUUM FILTERS
CSL, CT, VL, VS, LRS Series

I = Industrial Duty S = Severe Duty E = Extreme Duty

					DIMENSIONS - inches							Rated Flow SCFM		
												Filter w/ SM	Filter w/ Element	Element Only
E	CT-SML235-200C	CT-851-200C	CT-850-200C	2"	13	7 5/8	9	10 7/8	9	5 5/8	2	40-110	175	290
E	CT-SML235-250C	CT-851-250C	CT-850-250C	2-1/2"	13	7 5/8	9	10 7/8	9	5 5/8	2	40-110	210	290
E	ST-SML235-300C	ST-235P-300C	ST-234P-300C	3"	19	9 7/8	13 1/2	17 2/16	14	10	25	100-200	520	570
E	ST-SML235-400C	ST-235P-400C	ST-234P-400C	4"	19	9 7/8	13 1/2	17 2/16	14	10	25	200-450	520	570
E	ST-SML345-400C	ST-235P-400C	ST-234P-400C	4"	19	9 7/8	13 1/2	17 2/16	14	10	25	100-200	520	570
E	ST-SML445-400C	ST-235P-400C	ST-234P-400C	4"	19	9 7/8	13 1/2	17 2/16	14	10	25	200-450	520	570

↑ Buy Above ↑ ↑ In Combo with Either ↑

"ST" denotes New See-Through bucket option
Patent Pending on SpinMeister.

Note: Model offerings and design parameters may change without notice.

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COMPACT VACUUM FILTERS

"VL" Series 3"-6" MPT, 4"-6" 125/150# Pattern Flange

APPLICATIONS & EQUIPMENT

- Vacuum Pumps & Systems – P.D., Side Channel, Rotary Vane, Screw, Piston
- Vacuum Packaging Equipment
- Vacuum Furnaces
- Blowers - Side Channel & P.D.
- Pneumatic Conveying Systems
- Remote Install for Piston, Screw & Centrifugal Compressors
- Factory Automation Equip
- Ash Handling
- Food Industry
- Paper Processing
- Glass, Ceramic Processing
- Waste Water Treatment
- Woodworking
- Cement
- Bag House Systems
- Envelope Manufacturing
- Medical Industry
- Chemical Processing

FEATURES & SPECIFICATIONS

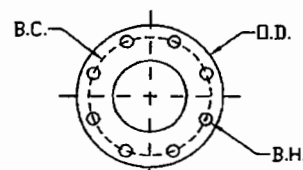
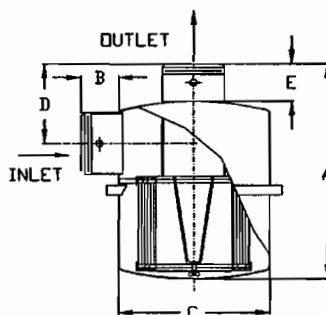
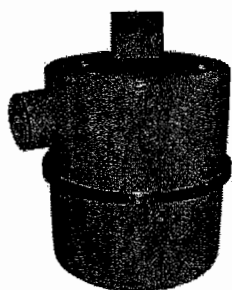
- **Vacuum level:** Typically 1×10^{-3} mmHg (1.3×10^{-3} mbar)
- Polyester: 99%+ removal efficiency standard to 5 micron
- Paper: 99%+ removal efficiency standard to 2 micron
- **Compact** design for space restrictions
- Quick release "V" band clamp for ease in maintenance
- Rugged all steel construction w/baked gray enamel finish
- Positive engagement O-ring seal system
- **Large** dirt holding capacity and **Easy** field cleaning
- Low pressure drop
- Inlet/outlet 1/4" gauge taps standard
- Temp (continuous): min -15°F (-26°C) max 220°F (104°C)
- Filter change out differential: 10" - 15" H₂O over initial delta P
- Pressure drop graphs available upon request

OPTIONS (Inquiries Encouraged)

- "Straight Through" design (VS Series)
- Extended Shell for **High Holding Cap.**
- Various media
- Available in **Stainless Steel**
- Epoxy coated housings
- Support brackets
- Special connections
- Activated carbon prefilters to reduce order

CONFIGURATION

DRAWING



Flange Orientation

Note: All side inlet to top outlet flanges are orientated "split center".

Approx. 13" Service Area Needed

I = Industrial Duty S = Severe Duty E = Extreme Duty

Dimension tolerance $\pm 1/4"$

	with Polyester Element	with Paper Element	Inlet & Outlet	Connection Style	DIMENSIONS - inches					Rated Flow SCFM Nominal Rating	Element Rating	Approx. Wt. lbs
					A	B	C	D	E			
E	VL-275P-300	VL-274P-300	3"	MPT	22 1/2	3 1/2	16	7	2 1/2	300	1100	63
E	VL-275P-400	VL-274P-400	4"	MPT	23 1/2	3 1/2	16	8	3 1/2	520	1100	63
S	VL-275P-500	VL-274P-500	5"	MPT	23 1/2	3 1/2	16	8	3 1/2	800	1100	63
I	VL-275P-600	VL-274P-600	6"	MPT	23 1/2	3 1/2	16	8	3 1/2	1100	1100	63
E	VL-275P-400F	VL-274P-400F	4"	FLG	23 1/2	3 1/2	16	8	3 1/2	520	1100	65
S	VL-275P-500F	VL-274P-500F	5"	FLG	23 1/2	3 1/2	16	8	3 1/2	800	1100	65
I	VL-275P-600F	VL-274P-600F	6"	FLG	23 1/2	3 1/2	16	8	3 1/2	1100	1100	65

125/150# Pattern Flg	DIMENSIONS - inches			No. of Holes	Flange Thickness
	O.D.	B.C.	B.H.		
4"	9	7 1/2	0.75	8	0.38
5"	10	8 1/2	0.88	8	0.38
6"	11	9 1/2	0.88	8	0.38

Note: Model offerings and design parameters may change without notice.

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COMPACT VACUUM FILTERS

"VS" Series 3"-6" MPT, 4"-6" 125/150# Pattern Flange

APPLICATIONS & EQUIPMENT

- Vacuum Pumps & Systems – P.D., Side Channel, Rotary Vane, Screw, Piston
- Vacuum Packaging Equipment
- Vacuum Furnaces
- Blowers - Side Channel & P.D.
- Remote Install for Piston, Screw & Centrifugal Compressors
- Factory Automation Equip
- Ash Handling
- Pneumatic Conveying Systems
- Food Industry
- Paper Processing
- Glass, Ceramic Processing
- Waste Water Treatment
- Woodworking
- Cement
- Bag House Systems
- Envelope Manufacturing
- Medical Industry
- Chemical Processing

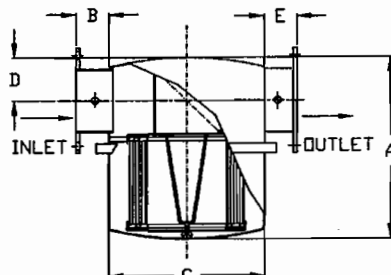
FEATURES & SPECIFICATIONS

- **Vacuum level:** Typically 1×10^{-3} mmHg (1.3×10^{-3} mbar)
- Polyester: 99%+ removal efficiency standard to 5 micron
- Paper: 99%+ removal efficiency standard to 2 micron
- **Compact** design for space restrictions
- Quick release "V" band clamp for ease in maintenance
- Rugged all steel construction w/baked gray enamel finish
- Positive engagement O-ring seal system
- **Large** dirt holding capacity and **Easy** field cleaning
- Low pressure drop
- Inlet/outlet 1/4" gauge taps standard
- Temp (continuous): min -15°F (-26°C) max 220°F (104°C)
- Filter change out differential: 10"-15" H₂O over initial delta P
- Pressure drop graphs available upon request

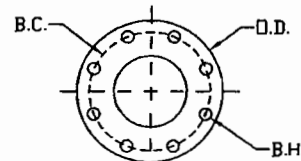
OPTIONS (Inquiries Encouraged)

- "L" design (VL Series)
- Extended Shell for **High Holding Cap.**
- Various media
- Available in **Stainless Steel**
- Epoxy coated housings
- Support brackets
- Special connections
- Activated carbon prefilters to reduce order

CONFIGURATION



Approx. 13" Service Area Needed



Flange Orientation

Note: All side inlet to outlet flanges are orientated "split center".

I = Industrial Duty S = Severe Duty E = Extreme Duty

Dimension tolerance $\pm 1/4"$

	with Polyester Element	with Paper Element	Inlet & Outlet	Connection Style	DIMENSIONS - inches					Rated Flow SCFM		Approx. Wt. lbs
					A	B	C	D	E	Nominal Rating	Element Rating	
E	VS-275P-300	VS-274P-300	3"	MPT	20	3 1/2	16	4 1/2	2 1/2	300	1100	65
E	VS-275P-400	VS-274P-400	4"	MPT	20	3 1/2	16	4 1/2	3 1/2	520	1100	65
S	VS-275P-500	VS-274P-500	5"	MPT	20	3 1/2	16	4 1/2	3 1/2	800	1100	65
I	VS-275P-600	VS-274P-600	6"	MPT	20	3 1/2	16	4 1/2	3 1/2	1100	1100	65
E	VS-275P-400F	VS-274P-400F	4"	FLG	20	3 1/2	16	4 1/2	3 1/2	520	1100	63
S	VS-275P-500F	VS-274P-500F	5"	FLG	20	3 1/2	16	4 1/2	3 1/2	800	1100	63
I	VS-275P-600F	VS-274P-600F	6"	FLG	20	3 1/2	16	4 1/2	3 1/2	1100	1100	63

125/150# Pattern Flg	DIMENSIONS - inches			No. of Holes	Flange Thickness
	O.D.	B.C.	B.H.		
4"	9	7 1/2	0.75	8	0.38
5"	10	8 1/2	0.88	8	0.38
6"	11	9 1/2	0.88	8	0.38

Note: Model offerings and design parameters may change without notice.

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INTEGRATED LIQUID SEPARATOR/ INLET VACUUM FILTER, For Vacuum Pumps

"LRS" Series, 3/4" to 12" Flange 125/150# Pattern



APPLICATIONS & EQUIPMENT

- The integrated liquid separator is primarily used in air process systems where liquids such as water or solvents need to be separated before the air reaches the air pump. Pump contamination leads to oil degradation, premature pump failures, and environmental problems.
- Food Packaging
- Pharmaceutical
- Chemical Processes
- Vacuum Pumps & Systems
- Soil Remediation

FEATURES & SPECIFICATIONS

- The high efficiency of the separator is accomplished by a baffling mechanism along with directional air flow changes. The final stage has a replaceable element for fine filtration. Designed for the air stream of a vacuum pump but can be used in most applications where liquid separation is needed.
- 99% liquid removal efficiency
- 1/2" Drain port standard
- Durable carbon steel construction with standard blue epoxy coating
- 1/4" taps on inlet/outlet ports standard for 2-1/2" and larger
- Max vacuum level: Typically 1×10^{-3} mmHg (1.3×10^{-3} mbar)
- Wide range of operation flows

BENEFITS

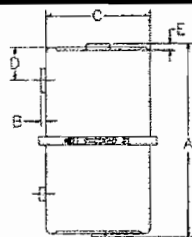
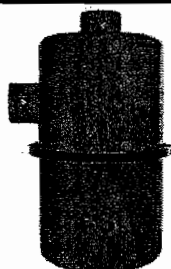
- Simplifies package by integrating liquid separator and vacuum filter
- High Efficiency Separation
- Reduce footprint
- Protects pump from harmful liquids that destroy lubricating/seal oil
- LRS Series is a configured product which enables unit to be modified to specific applications
- Easy Maintenance
- Save costs on unnecessary piping
- Prevents emulsification of oil in oil lubricated systems
- Potentially harmful liquids are prevented from entering pump

OPTIONS (Inquiries Encouraged)

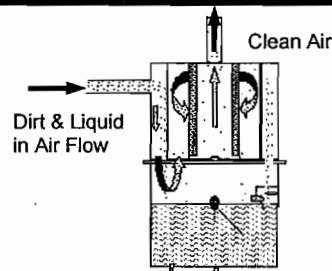
- **Stainless Steel** assemblies
- Vacuum gauges
- Special connections
- Additional ports
- Support legs

CONFIGURATION

DRAWING



Dimension tolerance $\pm 1/4"$



Reference Only Model No. with Polyester Element	FPT Inlet & Outlet	Reference Only DIMENSIONS - inches					Nominal SCFM Rating	Approx Holding Capacity Gal.
		A	B	C	D	E		
LRS-19-075HC	3/4"	17	3/4	7 11/16	3	3/4	60	1.5
LRS-19-100HC	1"	17	3/4	7 11/16	3	3/4	85	1.5
LRS-19-125HC	1-1/4"	18	3/4	7 11/16	3	3/4	85	1.5
LRS-19-150HC	1-1/2"	18	3/4	7 11/16	3	3/4	100	1.5
LRS-237-200HC	2"	22 1/4	3/2	12	3 3/4	3 1/2	135	2.5
LRS-237-250C	2-1/2"	24 3/8	4 1/8	12	3 3/4	2 7/8	195	2.5
LRS-237-300C	3"	25 1/8	2 7/8	12	3 3/4	2 7/8	300	2.5
LRS-275-400F	4" Flg	24 3/8	4	16	5 3/16	4	520	4.5
LRS-275-600F	6" Flg	40 1/2	5	16	4 1/4	5	830	4.5
SRS-377-800F	8" Flg	Configured According to Specifications					1275	10
SRS-385-1000F	10" Flg						1300	10
SRS-385-2000F	12" Flg						1800	10



Straight Through Style,
"SRS" Concept

Note: Model offerings and design parameters may change without notice.

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STANDARD REPLACEMENT PARTS/ACCESSORIES

For All Inlet Vacuum Filters

REPLACEMENT PARTS

Parent Model Model-Element-Connection	Prefilter Model	Housing						Element		
		Top Model No.	O-Ring Model No.	Gasket(s)/ Adapter Model No.	Wingnut(s) Model No.	Washer(s) Model No.	Clips/ Bolts Model No.	Top Plate Model No.	Wingnuts/ Bolt Model No.	Washer(s) Model No.
CSL-825/824-xxx	N/A	T824	OR337	BG224	N/A	N/A	CPWF	N/A	N/A	N/A
CSL-843/842-xxx	PF842	T842	OR550	BG268	N/A	N/A	CPWF	N/A	N/A	N/A
CSL-849/848-xxx	PF848	T848	OR675	BG281	N/A	N/A	CPWF	N/A	N/A	N/A
CSL-851/850-xxx	PF850	T850	OR750	BG412	N/A	N/A	CPWF	N/A	N/A	N/A
CSL-239/238-xxx	PF238	TD238	OR1250	N/A	N/A	N/A	CPWF	N/A	WN38X16	WR38X16
CSL-235/234-xxx	PF234	TC1400	OR1200	N/A	WN38X16	WR38X16	BT38163	T8000437	WN38X16	WR38X16
CSL-335/334-xxx	PF334	TC1400	OR1200	ADEX300	WN38X16	WR38X16	BT38163	T8000437	WN38X16	WR38X16
CSL-245/244-xxx	PF244	TC1850	OR1600	N/A	WN38X16	WR38X16	BT38163	T1000437	WN38X16	WR38X16
CSL-345/344-xxx	PF344	TC1850	OR1600	ADEX300	WN38X16	WR38X16	BT38163	T1000437	WN38X16	WR38X16
CSL-275/274-xxx	PF274	TC1850	OR1600	N/A	WN38X16	WR38X16	BT38163	T12000437	WN38X16	WR38X16
CSL-375/374-xxx	PF374	TC1850	OR1600	ADEX300	WN38X16	WR38X16	BT38163	T12000437	WN38X16	WR38X16
CSL-377/376-xxx	PF376	TC2250	OR2000	N/A	WN38X16	WR38X16	BT38163	T14750625	HN50X13	WR50X13
CSL-384(2)-xxx	PF384(2)	N/A	OR2400	N/A	WN38X16	WR38X16	BT38163	T19750625	HN50X13	WR50X13
CSL-685-xxx	PF684	N/A	OR2400	N/A	WN38X16	WR38X16	BT38163	T19750625	HN50X13	WR50X13
CSL-485(2)/484(2)-xxx	PF484(2)	N/A	OR2400	N/A	WN38X16	WR38X16	BT38163	T19750625	HN50X13	WR50X13
CT-851/850-xxx	PF850	N/A	OR725	BG412	N/A	N/A	CPWF	N/A	N/A	N/A
CT-235/234-xxx	PF234	N/A	GCT1100	ADCT234	N/A	N/A	CPWF	T8000437	BH38X16	WR38X88
CT-275/274-xxx	PF274	N/A	OR386	ADCT234	N/A	N/A	KITCT274	T12000437	BH38450	WR38X16
VS-275/274-xxx	PF274	N/A	OR386	N/A	N/A	N/A	N/A	T12000437	WN38X16	WR38X16
VL-275/274-xxx	PF274	N/A	OR386	N/A	N/A	N/A	N/A	T12000437	WN38X16	WR38X16

Note: Contact Solberg about replacement parts for LRS Series

INLET VACUUM FILTERS
CSL, CT, VL, VS, LRS Series

VACUUM GAUGE

Solberg's Vacuum Gauges shows the amount of restriction across the filter assembly or filter element. This is a convenient and inexpensive solution to receiving the maximum usage from every element.

Model: VG-030-025

• 0-30" Hg with 1/4" MPT back mounted connection



Model: VGB-030-025

• 0-30" Hg with 1/4" MPT bottom mounted connection



It is mounted on the 1/4" tap hole on the inlet and outlet connections of the CSL, CT, VS, and VL series.

NEW SEE-THROUGH FILTERS

- Maintenance checks are simplified with visual inspections
- Reduce downtime by eliminating need to shut down system to check filter
- Tested to withstand impacts and fractures at full vacuum
- Great for extreme duty applications
- High heat resistance for sterile environments
- All the benefits you rely on with Solberg's CT Series "T" Style filters



Available Models:
ST-235P-400C, ST-234P-400C,
ST-235P-300C, ST-234P-300C



Available Models for Extreme Duty
SpinMeister™ Applications:
ST-SML445-400C, ST-SML345-400C
ST-SML445-300C, ST-SML345-300C
Patent Pending on SpinMeister™

Note: Model offerings and design parameters may change without notice.

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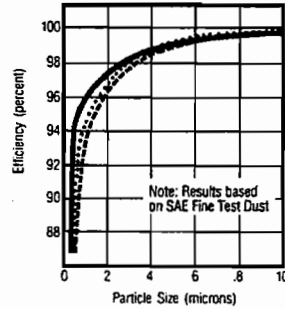


REPLACEMENT ELEMENTS

POLYESTER ELEMENTS

Particle Size vs. Filter Efficiency on polyester media at indicated face velocity:

15 cfm/ft² media —————
 30 cfm/ft² media
 45 cfm/ft² media - - - - -



- 99+% removal efficiency to 5 micron
- Reinforced with epoxy coated steel wire on both sides of cloth
- Washable - lukewarm water & mild detergent
- Dust loading capacity is increased 40 - 50% with polyurethane prefilter
- Temp (continuous):
min -15°F (-26°C) max 220°F (104°C)
- Optimal sealing surface & design

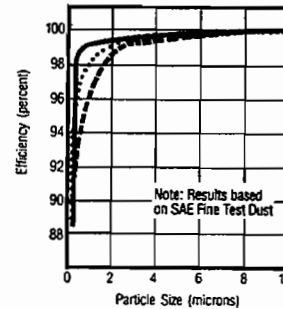
ADVANTAGES

- Less maintenance
- More durable
- Moisture resistant
- Handles hot air and oil mist from unload cycle of reciprocating/piston compressor

PAPER ELEMENTS

Particle Size vs. Filter Efficiency on paper media at indicated face velocity:

10 cfm/ft² media —————
 15 cfm/ft² media
 20 cfm/ft² media - - - - -

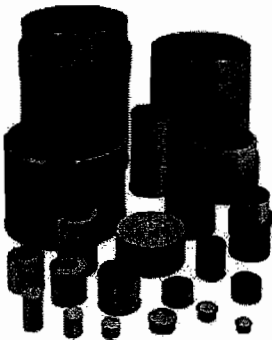
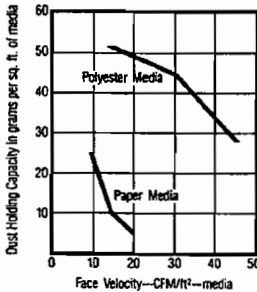


- 99+% removal efficiency to 2 micron
- Heavy duty industrial strength paper surrounded by heavy gauge galvanized expanded metal
- Dust loading capacity is increased 40 - 50% with polyurethane prefilter
- Temp (continuous):
min: -15°F (-26°C) max 220°F (104°C)
- Optimal sealing surface & design

ADVANTAGES

- Optimal surface area per given size
- Higher efficiency than many alternative media
- Cost Effective

Face Velocity vs. Dust Holding Capacity



INLET VACUUM FILTERS
CSL, CT, VL, VS, LRS Series

Legend

B= Closed one end w/ Bolt hole,
open on other end
C= Closed one end, open on other end
F= Felt gaskets on open end(s)
G= Galvanized metal endcaps
I= Injection molded santoprene
M= Molded plastisol
N= Neoprene gaskets on open end(s)
R= Mixed Rubber/cork gasket on
open ends
T= Tin plated metal endcaps

For other media types please see
element brochure, Bulletin EL or contact
your representative for more information.
Inquires encouraged.

Note: Model offerings and design
parameters may change without notice.



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Polyester	Paper	STD Endcap Features	DIMENSIONS - inches			Polyester Surface Area ft ²	Paper Surface Area ft ²	Rated Flow SCFM
			ID	OD	HT			
05	04		—	2 1/2	1	0.2	0.2	8
07	06		—	3 1/8	1 3/8	0.58	0.36	12
11	10		—	4 1/4	1 3/8	1	0.64	35
15	14	M	3	4 3/8	2 5/16	0.50	1.12	35
19P®	18P	M	3	4 3/8	4 3/4	1.5	3.0	100
31P	30P	M	3 5/8	5 3/4	4 3/4	2.3	6.2	195
231P	230P	M	3 5/8	5 3/4	9 1/2	4.5	11.8	300
825	824	IG	4 1/2	2 1/2	2 1/2	1.36	0.92	25
843	842	I	2 3/8	2 1/8	2 3/4	0.60	1.7	55
849	848	TR	2 9/16	3	2 7/8	2.0	5.0	115
851	850	TR	3 1/2	5 7/8	3 3/4	4.5	14.0	290
237	236	GB	4 11/16	7 3/4	8 1/2	8.5	—	550
239	238	GBN	4 7/8	9 1/4	10	13	30	570
35P	34P	M	4 3/4	7 7/8	4 13/16	4.0	11	275
235P	234P	M	4 3/4	7 7/8	9 5/8	8.3	22.8	570
335P	334P	M	4 3/4	7 7/8	14 1/2	12	34	800
246P	244P	GNM	15	9 3/4	9 3/8	14	35.5	880
346P	344P	GN	9	9 3/4	11 1/2	22.1	57	1000
275P	274P	GN	8	11 3/4	9 5/8	19	45.1	1100
375P	374P	GN	8	11 3/4	14 1/2	28	68.1	1500
377P	376P	GN	9	14 5/8	14 1/2	50	125	1825
385P	384P	GN	14	19 5/8	14 1/2	50	140	3300
485P	484P	GN	14	19 5/8	21 1/2	75	200	4705
685P	—	GN	14	19 5/8	28 1/2	100	—	6600

P = Polyurethane Prefilter

Dimension tolerance ± 1/4"

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alpha Tim Harmon 954-450-5100



PRESSURE DROP VERSUS FLOW FOR SMI FILTERS/ELEMENTS

Test Machine: XXXXXXXXXX

Choose Filter or Element Number...
Enter Flow Rate in SCFM.....

Last Test Date: XXXXXXXXXX

SCFM

Pressure Drop =
Estimated Pressure Drop =

Inches of Water/WC

XXXXXXXXXX

NOTES:

1. Filter/Element numbering are in standard convention: i.e. CSL-235P-300 etc.
2. All elements begin with the # sign, i.e #10 or #234.
3. All the filters/elements have been tested for their rated flows.
4. If a negative value shows up, please contact the Engineering Department for theoretical values.
5. (NA) denotes that the test date is Not Available.
6. Do NOT re-save program.

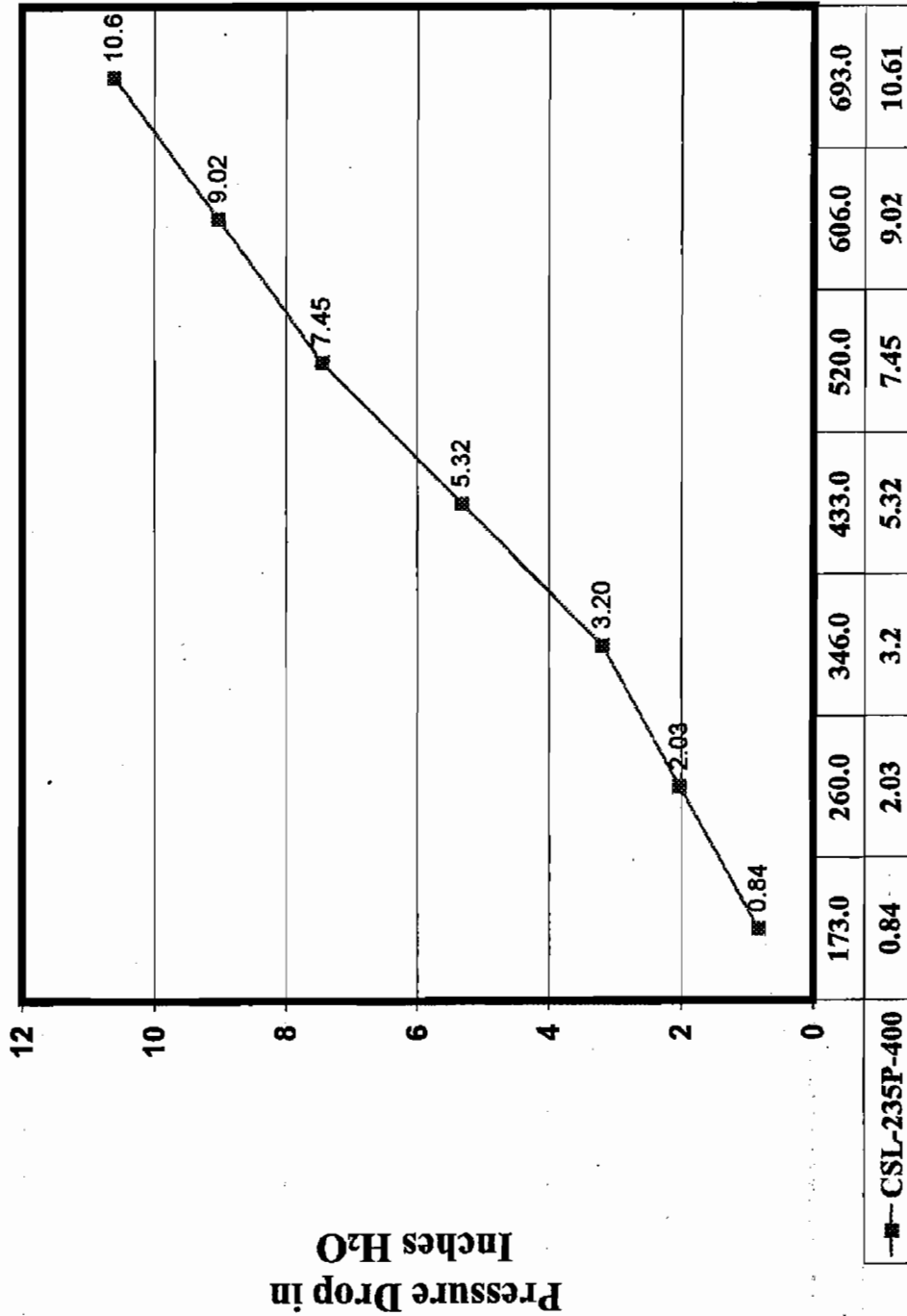
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[Signature]
 Nicholas

Solberg Manufacturing Pressure Drop Curve

—■— CSL-235P-400



SCFM-top row ("H₂O-bottom row)

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PRODUCT DATA SHEET

VF SERIES FILTERS

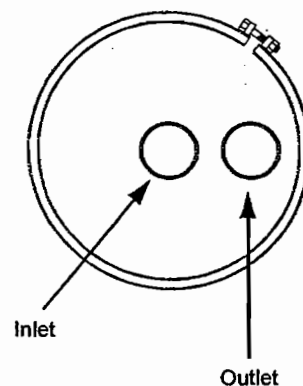
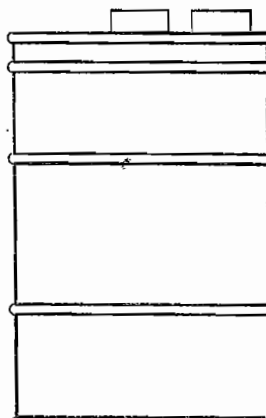
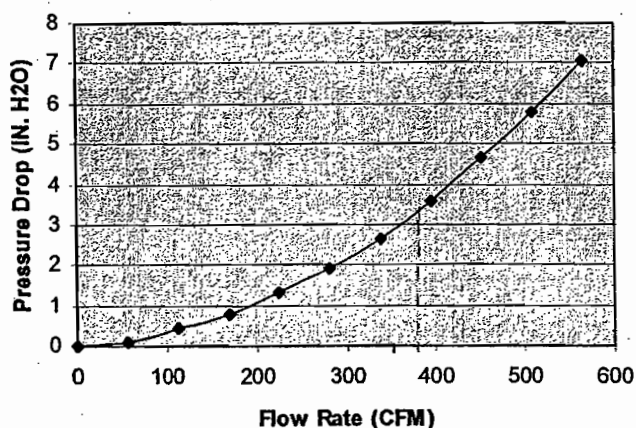
MODEL VR-140

The VR-140 filter is a radial flow filter vessel designed to treat vapor streams where pressure drop is a strong concern. With the radial design in certain applications the user can obtain higher flow rates than could be obtained in similar upflow filters. Some applications include:

- Soil Vapor Extraction Treatment
- Air Stripper Off Gas Treatment
- Odor Removal System
- Storage Tank Purge Vapor Treatment
- Industrial Process Treatment

Picture not currently available

PRESSURE DROP GRAPH
(As Filled 4*10 GAC)



VR-140 SPECIFICATIONS

Overall Height	3'2"	Vessel/Internal Piping Materials	CS/ SCH 40 PVC
Diameter	23"	Internal Coating	Polyamide Epoxy Resin
Inlet / Outlet (FNPT)	4" FNPT	External Coating	Urethane Enamel
Drain / Vent (FNPT)	OPT	Maximum Pressure / Temp	6 PSIG / 150° F
GAC Fill (lbs)	140	Cross Sectional Bed Area	5.6 FT ²
Shipping / Operational Weight (lbs)	200/225	Bed Depth/Volume	7.25 IN / 5 FT ³

Tetrasolv Filtration
1200 East 26th Street - Anderson, Indiana 46016 U.S.A
Phone (765) 643-3941 Fax (765) 643-3949 Email: info@tetrasolv.com

Filtration Accessories

Moisture Separator™

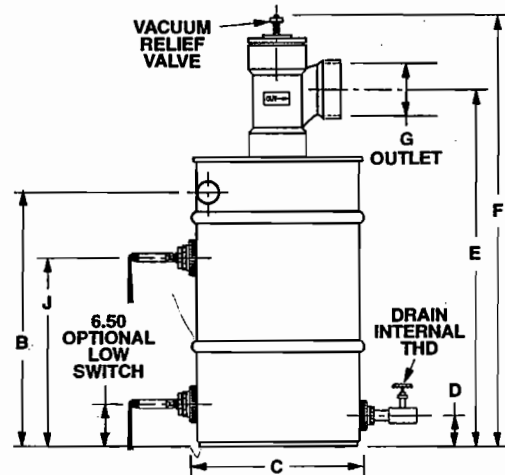
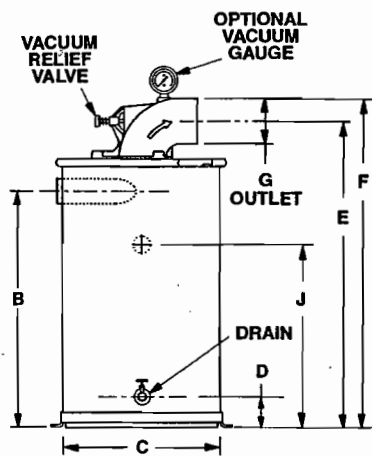
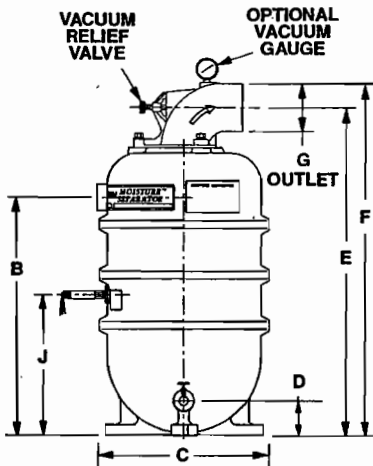
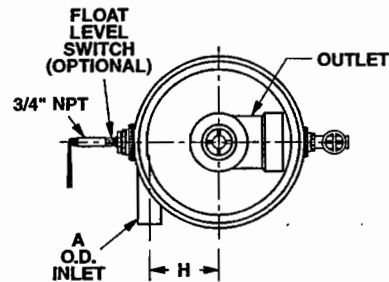
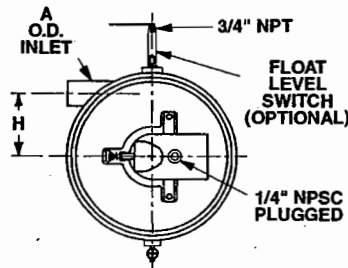
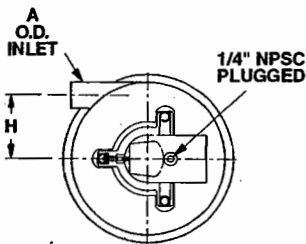
By separating and containing entrained liquids, Rotron's moisture separator helps protect our regenerative blowers and the end treatment system from corrosion and mineralization damage. Recommended for all soil vacuum extraction applications.

Blower Connection Key

NPT – American National Standard Taper Pipe Thread (Male)
NPSC – American National Standard Straight Pipe Thread for Coupling (Female)
SO – Slip On (Smooth – No Threads)

SPECIFICATIONS:

SEPARATION METHOD – High Efficiency Cyclonic
RELIEF VALVE MATERIAL – Brass & Stainless Steel
FLOAT MATERIAL – Copper
FLOAT SWITCH – SPDT, Explosion-proof
NEMA 7&9, 5 Amp max.



PLASTIC "P" DESIGN

METAL "D" DESIGN

METAL "B" DESIGN

Model	Part No.	CFM Max.	A Dia.	B	C Dia.	D	E	F	G Dia.	H	J Switch	Drain Internal THD	Shipping Weight
MS200PS	038519	200	2.38	22.46	16.42	3.25	31.05	33.30	4.50 OD	6.00	13.25	3/4" NPT	42 lb.
MS300PS	038520	300	2.88							6.01	15.00		
MS200DS	080086	200	2.00							5.76	15.00		
MS300DS	080087	300	2.50	24.50	14.00	3.00	39.00	30.33	6.63 ID	9.75	16.87	1" NPT	82 lb.
MS350BS	038357	350	3.25										95 lb.
MS500BS	038354	500	4.00										96 lb.
MS600BS	038353	600	4.00	27.87	23.00	5.00	37.37	54.50	9.25	9.25	24.00	1" NPT	96 lb.
MS1000BS	038914	1000	6.00										150 lb.

Models without float switch available. Metal MS200/300DS models are not the standard stocked, but are available.

Blower Model Reference Key	
A = SPIRAL	E = DR/EN/CP 606, S543, 6, 623, S7, S75
B = DR/EN/CP 068, 083, 101, 202	F = DR/EN/CP 707, 808, S85, 858, S9, P9 (Inlet Only)
C = DR/EN/CP 303, 312, 313, 353	G = DR/EN/CP 823, S13, P13 (Inlet Only)
D = DR/EN/CP 404, 454, 513, 505, 555, 523	H = DR/EN/CP 909, 1223, 14, S15, P15 (Inlet Only)

2.0 Moisture Separator™ Specifications

2.1 DUTY

The moisture separator shall be designed for use in a soil vapor extraction system capable of continuous operation with a pressure drop of less than six inches of water at the rated flow of _____ SCFM. The separator shall be capable of operation under various inlet conditions ranging from a fine mist to slugs of water with high efficiency.

2.2 PRINCIPLE OF OPERATION

The moisture separator shall incorporate cyclonic separation to remove entrained water. The separator must protect against an overflow by fail safe mechanical means. An electrical switch or contact(s) alone is not an acceptable means of protection against overflow, but is a good backup.

2.3 CONSTRUCTION

The body of the moisture separator shall be constructed of heavy wall plastic or heavy gauge cold rolled steel. The steel interior and exterior shall be epoxy (powder) coated to resist abrasion, corrosion, and chipping that might expose the surface. The inlet shall be tangentially located and welded to the body. The outlet port shall be constructed of PVC or cast aluminum alloy, flanged and sealed to the center of the top of the separator. The separator shall incorporate a non-sparking copper

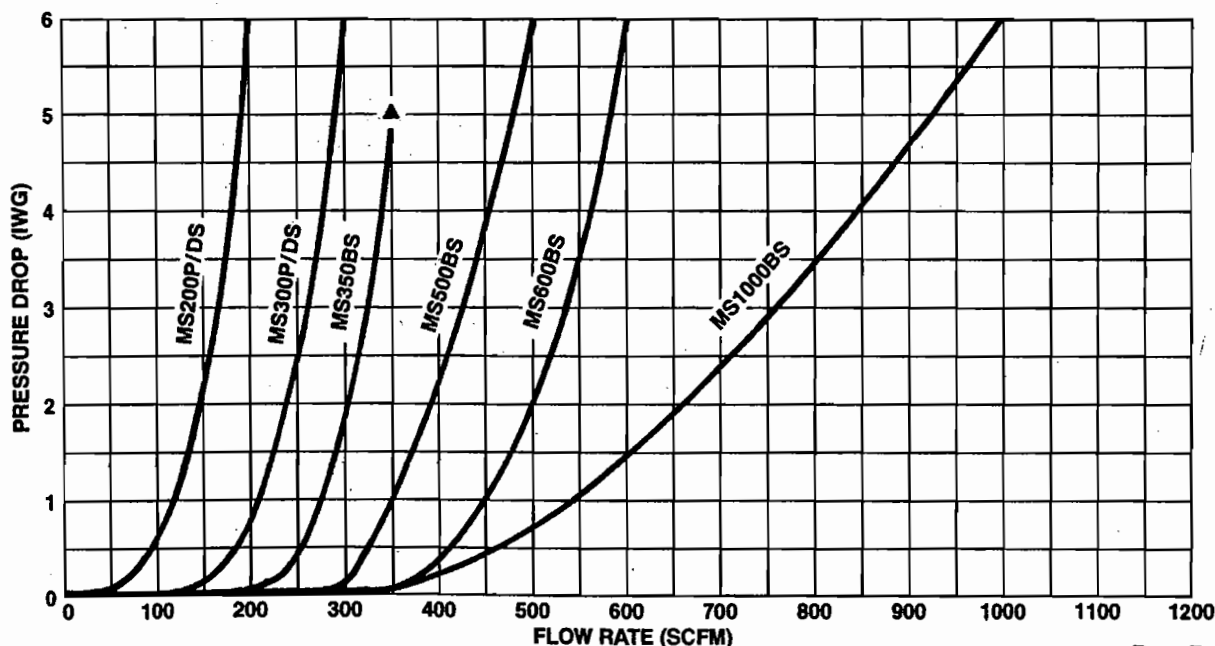
float ball and an adjustable relief valve to protect against overflow and overheating the blower.

2.4 CAPACITY AND DIMENSIONS

The moisture separator must have a liquid capacity of _____ gallons. The inlet shall be _____ inch OD slip-on type. The outlet shall be _____ inch OD slip-on type.

For DR/EN/CP Blower Model	Selector Moisture Separator Model	Liquid-holding Capacity (gallons)	Inlet (OD)	Outlet	Max Vacuum Allowed (IHg)
404 454 505 513 523 555 623 823	MS200PS	7	2.38	4.5" OD	12
	MS200DS	10	2.0		22
606 6 707	MS300PS	7	2.88		12
	MS300DS	10	2.5		22
808	MS350BS	40	3.25	6.63" ID	22
858 1223	MS500BS		4.0"		
909 14	MS600BS MS1000BS	65	6.0"	9.25" OD	

2.5 PRESSURE DROP



Rev. D 05/05/96

Blower Model Reference Key	
A = SPIRAL	E = DR/EN/CP 606, S543, 6, 623, S7, S75
B = DR/EN/CP 068, 083, 101, 202	F = DR/EN/CP 707, 808, S85, 858, S9, P9 (Inlet Only)
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D = DR/EN/CP 404, 454, 513, 505, 555, 523	H = DR/EN/CP 909, 1223, 14, S15, P15 (Inlet Only)

Noise Reduction Accessories

AMETEK Rotron Industrial Division strives to maintain a complete inventory of accessories to complement the Rotron Regenerative Product Line. If there is an Accessory

Product that is not listed in this Accessory Guide, please do not hesitate to contact AMETEK Rotron Industrial's Application Engineering Department directly with your requirements.

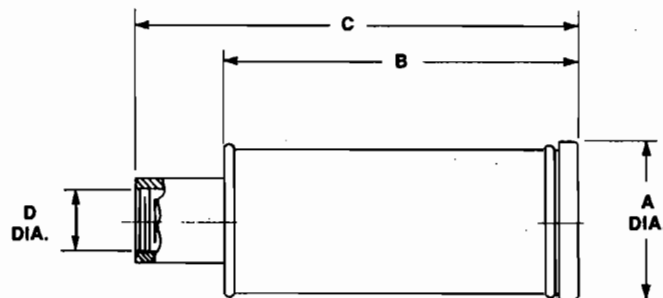
Inlet/Outlet Muffler (Single Connection)

Mufflers lower blower noise in areas where reduced sound levels are required.

SPECIFICATIONS:

HOUSING – Steel

MEDIA – Acoustical Material



Part Number	Reference Blower Model	Connection	Dimensions (Inches)			
		Inlet	A	B	C	D
523627	B	1.0 NPT	4.00	10.93	13.98	1.00
516838	B	1.0 SO	1.90	5.16	6.23	1.00
523626	C	1.25 NPT	4.00	10.93	14.07	1.25
523625	D	1.50 NPT	4.00	10.93	14.57	1.50
523624	E	2.00 NPT	4.00	10.93	12.16	2.00
523623	E	2.00 NPSC	4.00	10.93	12.43	2.00
523622	E	2.00 NPT	4.00	15.75	16.95	2.00

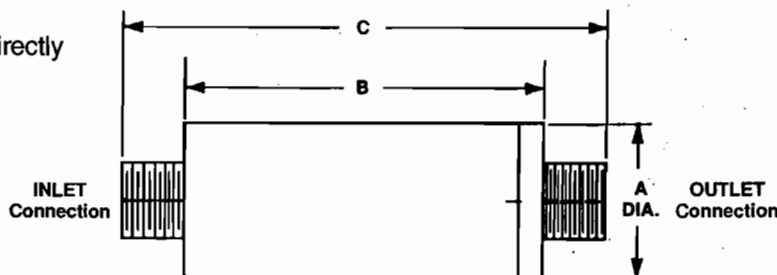
Inline Muffler (Dual Connection)

Inline Mufflers are utilized for noise reduction in applications where piping systems are connected directly to both ends of the muffler.

SPECIFICATIONS:

HOUSING – Steel

MEDIA – Acoustical Material



Part Number	Reference Blower Model	Connection		Dimensions (Inches)		
		Inlet	Outlet	A	B	C
550888	D	1.5 NPT-M	2.0 NPT-F	4.00	12.75	15.5
522948	E	2.0 NPT-M	2.0 NPSC-F	4.00	15.75	18.15
529900	E	2.00 NPSC-F	2.0 NPSC-F	4.38	15.75	18.15
523621	E	2.00 NPT-M	2.00 NPT-M	4.00	15.75	18.15
515185	F	2.50 NPT-M	2.50 NPT-F	6.12	15.00	19.37
511569	G	3.00 NPT-M	3.0 NPT-F	7.00	18.00	22.25
515210	G	4.00 NPT-M	4.0 NPT-F	10.00	24.00	30.00
516264	H	4.00 NPT-M	4.0 NPT-F	8.00	22.00	27.75
516265	H	6.00 NPT-M	6.0 NPT-F	12.00	30.00	36.75

MAINTENANCE

NEPCCO

RECOMMENDED MONTHLY MAINTENANCE CHECK LIST - MISCELLANEOUS

DATE _____

FILTERS - Check pressure gauges before and after bag filters.

(NEPCCO recommends 30 psi maximum pressure differential)

CARBON -

1. Test for effluent break through.
2. Check differential pressure.
3. Touch up paint on any exposed metal to prevent rust.
4. Collect influent and effluent samples.

MAINTENANCE COMPLETED BY:

[illegible]

FAILURE TO PERFORM RECOMMENDED MONTHLY MAINTENANCE MAY RESULT IN PREMATURE EQUIPMENT FAILURE AND VOID APPLICABLE WARRANTIES.

NEPCCO

RECOMMENDED MONTHLY MAINTENANCE CHECK LIST - SYSTEM

DATE/

1. Collect influent and effluent samples.
2. Insure no leaks in system piping.
3. Inspect system instrumentation for damage.
4. Check site condition (pick up trash, etc.).
5. Inspect fence/building for damage.

MAINTENANCE COMPLETED BY:

[illegible]

FAILURE TO PERFORM RECOMMENDED MONTHLY MAINTENANCE MAY RESULT IN PREMATURE EQUIPMENT FAILURE AND VOID APPLICABLE WARRANTIES.



ADJUSTABLE SPEED DRIVE

SERIES 15H

Inverter Control

Installation & Operating Manual

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Appendix F

Engineer's Opinion & Probable
Cost

Soil Vapor Extraction System Estimated Capital Costs

Permits and Engineering.....	\$5,000
• Permit Drawings ,Permit Fees, Permitting	
Construction.....	\$50,000
• New SVES Trailer	
System Installation.....	\$35,000
• Trenching	
• Trenching Under Wall	
• Three Vacuum Monitoring Points	
• Piping to the SVE Trailer	
Electrical Installation	\$10,000
• Connection of Transformer to SVE Trailer	
• Breaker Box	
• Wires & Conduit	
• Connection	
Engineering Services During Construction	\$5,000
• Shop Drawing Review	
• Backfill and Resurfacing Materials Review	
• Site Visits for Engineer-of-Record	
Startup & First Month of Operation	\$10,000
Total Estimated Capital Costs	\$115,000

Operation and Maintenance Estimated Cost

Operation and maintenance costs have been calculated for the first year of operation. The cost include regular maintenance visits, sampling and analysis, and report preparation.

Quarterly Operation, Maintenance, and Reporting	\$8,000
First Year Operation and Maintenance (4 quarters)	\$32,000



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