PROGRESS REPORT
SVE PILOT TEST AT PARCEL C INSTALLATION RESTORATION SITES
HUNTERS POINT NAVAL SHIPYARD
SAN FRANCISCO, CALIFORNIA

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1220 Pacific Highway
San Diego, California 92132-5187

Submitted by:

IT Corporation
4005 Port Chicago Highway
Concord, California 94520-1120

IT CORPORATION
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Southwest Division
Michelle Crook, 02R4.MC
1230 Columbia St., 8th Fl Rm 103
San Diego, CA 92132-5190

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FROM:
Mike Garant
Project Manager

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Mustafe Botan, Concord (1C/1E)

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Table of Contents

List of Tables

List of Appendices

Acronyms and Abbreviations

bfs	below floor surface
cfm	cubic feet per minute
DCE	dichloroethene
EPA	U.S. Environmental Protection Agency
Hg	mercury
HPNS	Hunters Point Naval Shipyard
IR	Installation Restoration
IT	IT Corporation
lb.	pound
lb./hr.	pound(s) per hour
PCE	tetrachloroethene
PID	photoionization detector
ppmv	parts per million by volume
ROI	radius of influence
SVE	soil vapor extraction
TCE	trichloroethene
TS	treatability study
VOC	volatile organic compound
VM	vapor monitoring
wc	water column

1.0 Introduction

This field activity report is prepared to provide information to the Department of Navy, Southwestern Division, concerning the progress of the soil vapor extraction (SVE) treatability testing being conducted at various installation restoration (IR) sites in Parcel C, within the Hunters Point Naval Shipyard (HPNS) in San Francisco, California. The treatability pilot testing is currently being performed by IT Corporation (IT) under the Remedial Action Contract No. N62474-98-D-2076, Contract Task Order No. 0033.

This report covers the period from post-system construction for the various SVE treatability study (TS) sites to the ongoing constant-rate testing at the end of February 2001. Areas addressed are the IR sites at Building 134, Building 211/253, and Building 251. Field activities performed in February 2001 are summarized in Section 2.0. Test data collected were reduced and are presented in Section 3.0. Subsequent activities to be covered in the next reporting period are highlighted in Section 4.0. Data summary tables and figures showing trend plots are included in the appendices.

2.0 Activities Completed During Reporting Period

Activities completed include installation of SVE and vapor monitoring (VM) wells and pilot-scale SVE equipment, baseline vapor sampling, step testing, and constant rate testing. The nature and sequence of these activities conducted were similar for all TS sites. Therefore, general descriptions of completed activities are presented herein in the following subsections. Site-specific details are provided where referenced.

2.1 Pilot-Scale System Installation

Upon construction of the pilot test system, IT installed a number of SVE and VM wells inside each of the building sites. The SVE wells are screened from near floor or ground surface to the lowest depths above groundwater tables measured from nearby monitoring wells. The VM wells are screened in two depths, where practicable—from near floor or ground surface to the lowest depths above groundwater tables. The shallow and deep VM wells are located adjacent to one another in separate boreholes. The locations and identification of the SVE and VM wells are in general accordance with the *Phase II Soil Vapor Extraction Treatability Study Work Plan* prepared by Tetra Tech EM, Inc., for HPNS, dated July 28, 2000 (TtEMI, 2000). The physical

locations of the wells were adjusted in the field to accommodate actual site conditions. Appendix A contains a summary of the as-built well construction details.

In addition to well installation, IT has installed an SVE blower system for the pilot testing at each site. Each system consists of a skid-mounted blower unit (equipped with a liquid-vapor separator, a condensate discharge pump, air filters, and silencers) and vapor-phase carbon vessels configured for series operation. Blower capacities and carbon quantities for the SVE systems are summarized in Table 1, "Soil Vapor Extraction Blower Capacity and Carbon Quantity for Each Installation Restoration Treatability Study Site," as follows:

Table 1
Soil Vapor Extraction Blower Capacity and Carbon Quantity for Each Installation Restoration Treatability Study Site

IR Site	Building Number	Blower Capacity	Carbon Quantity
25	134	850 cfm at 10 inches Hg	8,000 pounds
28	211/253	250 cfm at 10 inches Hg	800 pounds
28	251	250 cfm at 10inches Hg	800 pounds

Hg denotes mercury

2.2 Baseline Wellhead Vapor Sampling

Prior to starting the pilot test, IT collected wellhead vapor samples from the SVE wells at each site. Samples were contained in SUMMA™ canisters and shipped to Smart Chemistry (formerly JPB Corporation) of Sacramento, California for U.S. Environmental Protection Agency (EPA) TO-14 analysis. Photoionization detector (PID) readings were also taken at the wellheads during vapor sampling. Analytical data and PID readings for each site are presented in Attachment 1, "Soil Vapor Wells Constructions As-Builts," to Appendix A.

2.3 Step Testing

Step testing began after the completion of equipment installation testing. Each of the SVE systems was tested at 2.5 inches mercury (Hg), 5 inches Hg, 7.5 inches Hg, and up to 10 inches Hg where feasible. The SVE blower unit at each site was used for the testing. Each test run was at least 2 hours. At the end of each test, oxygen content and PID readings were taken at the wellheads of each SVE well and VM well using field instruments. Influent and effluent vapor samples were collected from the vapor-phase carbon adsorption units to determine carbon treatment efficiencies. The samples were shipped in SUMMA™ canisters to Smart Chemistry for EPA TO-14 analysis.

Field data collected from the step testing at each site were summarized and reduced. A plot of extraction airflow yield at the test well versus vacuum applied during the step testing at each TS site was presented in Appendix B (see respective Figure 1).

2.4 Constant Rate Testing

The constant rate test began on February 1 for Building 251, February 5 for Building 211/253, and February 19 for Building 134. The SVE blowers were placed on 24-hour continuous run. System operations were monitored at various frequencies: from once every 2 hours for the first 8 to 10 hours on the first day of operation to once every 8 hours on the third day of the operation. Beginning the fourth day of continuous operation, system monitoring at each site was reduced to once daily. Carbon treatment system samples were collected once daily for the first three days of operation and then once a week thereafter for the subsequent two weeks of operation. After approximately two weeks of system monitoring, system samples were taken once every two weeks. System performance information gathered during the constant rate testing is presented in Section 3.0.

3.0 Data and Results Presentation

This section briefly discusses the performance of the SVE pilot test system based on results observed in the following four areas: (1) radius of vacuum influence, (2) extraction flow rate and mass removal, (3) carbon treatment, and (4) well performance.

3.1 Radius of Vacuum Influence

The initially estimated radii of vacuum influence for the three sites are presented in Table 2, Estimated Radius of Vacuum Influence for the Three Soil Vapor Extraction Treatability Study Sites." The radius of influence (ROI) is determined based on a minimum vacuum reading of 0.1 inch water column (wc) observed at the furthermost observation well from the SVE well.

3.2 System Extraction Flow Rate and Volatile Organic Compound Mass Removal

At the beginning of the constant rate tests, adjustments at the SVE wellheads were made to optimize the system operation. Where liquid entrainment was noted, the wellhead vacuum was reduced to minimize the amount of liquid entering the SVE unit. For the system at Building 251, significant liquid entrainment did not occur until a few days of continuous operation. For Building 211/253 and Building 134, excessive moisture was observed in the vapor stream entering from some of the SVE wells into the blower systems on the first day of operation. For

Table 2
Estimated Radius of Vacuum Influence for the Three Soil Vapor Extraction Treatability Study Sites

IR Site	Building Number	Vacuum Selected for Constant Rate Test (inches Hg)	Estimated ROI (feet) (a)
25	134	5	24 to 58
28	211/253	7.5	11 to 50
28	251	7.5	35 to 43

(a) These initially estimated values are based on the step test results. Some of the greater values may be due to preferential pathways in the subsurface.

Building 134, most of those wells are located near the below-grade concrete sump. As a result, system airflow was gradually reduced. Since the commencement of the constant rate test, the extraction airflow yield at the three TS sites ranged from 110 cubic feet per minute (cfm) to 800 cfm.

The rate of volatile organic compound (VOC) mass removal from the vadose zone at each site is summarized in Table 3, "Summary of Volatile Organic Compound Mass Removal Rate and Cumulative Mass Removal," as follows:

Table 3
Summary of Volatile Organic Compound Mass Removal Rate and Cumulative Mass Removal

IR Site	Building Number	VOC Mass Removal Rates (lb./hr.)	Predominant VOC Species Detected	Cumulative VOC Mass Removal (lb.)
25	134	7.0E-4 to 3.0E-3	PCE and TCE	0.4
28	211/253	3.0E-3 to 3.0E-2	Cis-1,2-DCE, TCE and Vinyl Chloride	5.0
28	251	3.0E-4 to 2.0E-3	Chlorobenzene and PCE	0.3

DCE denotes dichloroethene.
lb. denotes pound.
lb./hr. denotes pounds per hour.
PCE denotes tetrachloroethene.
TCE denotes trichloroethene.

The VOC mass removal rates for systems at Building 211/253 and Building 251 showed up to order-of-magnitude decreases after approximately one month of continuous operations. The system at Building 134 showed only a slight decrease; however, the system operating time was

only half of those for the other two systems. For each site, the mass removal trend corresponded closely to that of the influent vapor concentration measured with a PID (see respective Figure 2 of Appendix B for each site). All mass removal rates were calculated based on the influent vapor sample analytical data. Appendix B contains plots of VOC mass removal rate and cumulative VOC mass removal over time for each site (see Figures 3 and 4, respectively). As shown in Table 3, the cumulative VOC mass removal from the subsurface since the commencement of the constant rate test ranged from 0.3 to 5.0 pounds. Predominant VOC species detected in the soil vapor at each site are also identified in the table.

3.3 Vapor-Phase Carbon Treatment

Based on the analytical results of the influent and effluent vapor samples collected from the vapor-phase carbon treatment units, the vapor treatment efficiencies for all three SVE systems were generally maintained above 90 percent. A slight detection of vinyl chloride was noted in an effluent vapor sample collected on February 19 from the SVE system at Building 211/253. However, this VOC was not detected in the influent sample, nor was it found in subsequent vapor samples. Therefore, it is believed that this one-time detection might be caused by a momentary upset of the SVE system and is not considered as an indication of carbon breakthrough.

PID readings were also used to provide qualitative monitoring of the carbon treatment efficiency. Results generally supported the laboratory data, except when the PID instruments experienced malfunctioning during measurement of the system vapor concentration. Most of the malfunctioning is believed to be caused by high moisture content in the vapor stream due in part to liquid entrainment in the SVE wells. In summary, the PID provided reasonably reliable readings for monitoring for carbon breakthrough. During the operating period, no carbon breakthrough occurred with any of the three systems. Vapor-phase carbon continued to effectively treat the soil vapor removed from the vadose zone.

3.4 Well Performance

Generally, most of the SVE and VM wells exhibited to some degree the characteristic patterns typical of SVE operations. The wellhead vapor concentrations, based on PID measurements, showed decreases since the commencement of the constant rate testing. More site-specific discussions on well performance among the three IR TS sites are presented as follows.

3.4.1 Building 134

All 17 SVE wells were operating, with an average airflow of approximately 38 cfm per well. Some wells are apparently located in a relatively more permeable subsurface area, resulting in

greater airflow yield. Because of the rather significant occurrence of liquid entrainment in a number of SVE wells, vacuum at about half of the SVE wells was reduced to cut down the amount of liquid entering the system. A few SVE wells were shut down completely for a short while to alleviate the liquid entrainment problem. Operations of those wells resumed after the amount of liquid observed at the wellheads was significantly reduced. Those wells were then operating at reduced vacuum levels to minimize recurrence of excessive liquid entrainment. As a result, the airflow yield also decreased. Most of the SVE wells are located near the northwestern end of the building and in the below-grade sump. The reduction in the well operating vacuums did not seem to have compromised the ROI substantially. Greater than 10 feet of the ROI continued to be observed after the adjustments at the wellheads.

Depth to groundwater was measured at two existing groundwater wells (IR25MW16A and IR25MW22A) inside the building during the SVE operation. The groundwater depths varied from 6.5 feet to 8.9 feet below floor surface (bfs). Water level at IR25MW22A showed an increase of almost 2 feet while that at IR25MW16A had less than 1 foot of increase. The water level rise is believed to have contributed to the excessive moisture observed at some of the SVE wellheads in the general area of IR25MW22A.

PID readings taken from the SVE wells were all lower than 40 parts per million by volume (ppmv), with slight fluctuations in the wellhead vapor concentrations in almost all wells. PID readings from the VM wells were relatively higher, with those from IR25SG57D and IR25SG58D being the highest, reaching to 600 ppmv. Both wells are located in the vicinity of an existing groundwater monitoring well IR25MW16A, near the center of the building. The PID measurements at the VM wells showed greater fluctuations compared to those at the SVE wells. It is not readily known whether those fluctuations were associated with the movement of VOC contaminants only in the subsurface soil and/or groundwater within the TS area.

3.4.2 Building 211/253

All five SVE wells were operating in this reporting period. Similar to those at Building 134, vacuum levels at some of the SVE wells at Building 211/253 were reduced to minimize liquid entrainment. Groundwater levels measured at IR28MW151A (located right in the entrance of the TS area) varied from 5.5 feet to 6.5 feet bfs during the SVE operation. Again, the water level rise is believed to have contributed to the significant liquid entrainment observed at the SVE wells. Airflow yield was maintained at approximately 34 cfm per well on average after wellhead adjustment. IR28VW2-17A is apparently located in a more permeable area, yielding more airflow than did other wells.

Except for IR28SG420S and IR28SG420D, all other VM wells experienced measurable vacuum influence (i.e., greater than 0.1 inch wc). IR28SG420S and IR28SG420D are both located more than 50 feet from any nearest SVE well, outside the estimated ROI for the SVE wells. These two wells would probably not be able to experience any vacuum influence. In view of the vacuum influence observed at the VM wells, the adjustments at the SVE wellheads did not seem to have adversely affected the ROI within the TS area.

Except for IR28SG427D, IR28SG429D, and IR28SG430D, PID readings taken at the wellheads of all other SVE and VM wells showed not greater than 500 ppmv. Most of them showed less than 100 ppmv. The three VM wells previously mentioned are all located inside concrete sumps. PID readings collected at IR28SG429D were the highest, ranging from greater than 2000 ppmv to 1000 ppmv at the end of the reporting period. For IR28SG427D and IR28SG430D, the PID readings dropped gradually from 1000 ppmv to less than 200 ppmv. Slight rebounds of wellhead vapor concentrations were noted for IR28SG427D, but not for IR28SG430D.

3.4.3 Building 251

All six (6) SVE wells were operating in this reporting period. Average airflow per well was approximately 27 cfm. IR28VW5-06A yielded relatively higher airflow compared to the other wells. This well is located outside the building. Air movement in the vadose zone was probably not as restricted as inside the building, where subsurface structure, such as wall footing, might inhibit air movement.

IR28VW5-06A was also one of the first few to show entrainment of liquid in the well near the beginning of the constant rate test. Groundwater levels were measured at IR58MW31A during system operation. This groundwater monitoring well is located outside the building. The closest SVE well is IR28VW5-06A, approximately 20 feet south of the groundwater well. Water levels varied from 5.0 feet to 6.7 feet below ground surface. The water level rose from 6 feet to 5.5 feet near the middle of the month and continued to rise to near 5 feet at the end of the month. Nevertheless, liquid entrainment to the SVE wells did not appear to be as significant as in the other two building sites. Slight adjustment was made at some of the six SVE wells at the beginning of the constant rate operation and then approximately midway into the month.

Vacuum influence appeared to be limited to the east and west of the SVE wells. The three shallow and deep VM wells west of IR28VW5-05A had not been showing greater than 0.1 inch wc vacuum since the startup of system operation. The three wells are IR28SG462S/D, IR28SG463S/D, and IR28SG464S/D and are separated from the SVE well by a wall. It is suspected that the wall footing might have limited the vacuum influence observed at the three

wells. The vacuum levels measured at IR28SG457S and IR28SG457D were noted to have dropped to less than 0.1" wc midway through the month of operation. It appeared that the water level rise might have caused the decrease in the vacuum readings.

Most of the SVE and VM wells showed less than 100 ppmv of total wellhead vapor concentrations (as measured by the PID instrument). SVE well IR28VW5-03A was the only well with a PID reading of greater than 900 ppmv at the beginning of the system operation. The total wellhead vapor concentration gradually decreased to less than 100 ppmv near the end of the month. The other wells that showed similarly high PID readings were IR28SG459D and IR28SG460D. Both wells exhibited substantial fluctuations with some degree of decreases in the wellhead vapor concentrations. All three wells are located in the concrete sumps inside the building. The extent of wellhead vapor concentration decrease will be continuously monitored as system operation continues.

4.0 Activities Anticipated for Next Reporting Period

The constant rate testing of the SVE pilot scale systems will continue. System monitoring will be on a weekly schedule, while system sampling for laboratory analysis will be on a biweekly schedule. Vapor-phase carbon treatment will be monitored for based on PID readings and laboratory vapor sample results.

APPENDIX A
DATA SUMMARY TABLES

Appendix A contains the following:

- Attachment 1: Soil Vapor Wells Constructions As-Builts
- Attachment 2: Baseline Wellhead Vapor Concentrations for SVE Wells at IR25 (Buildings 134, 211, and 251)

ATTACHMENT 1
SOIL VAPOR WELLS CONSTRUCTIONS AS-BUILTS

Soil Vapor Well Construction As-Builts

				Direct Push / Continuous soil sampling				Well Completion			
Vapor Extraction Wells											
Parcel	IR	Well No.	Well Type	Boring drill date	Date Soil samples collected/shipped	TD of boring (feet bgs)	Comments	Date of Well completion	Well TD	Screen Interval	Well Diameter (in.)
C	IR-25	IR25VW6-03A	VEW	10/11/00	10/11/00	10		10/18/00	10.0	2 - 10 '	4 "
C	IR-25	IR25VW6-04A	VEW	10/11/00	10/11/00	10		10/18/00	10.0	2 - 10 '	4 "
C	IR-25	IR25VW6-05A	VEW	10/11/00	10/11/00	10		10/18/00	10.0	2 - 10 '	4 "
C	IR-25	IR25VW6-06A	VEW	10/12/00	10/12/00	6	In sump 4' below surrounding bldg floor - hand sample	10/24/00	10.0	2 - 6 '	4 "
C	IR-25	IR25VW6-07A	VEW	10/12/00	10/12/00	6	In sump 4' below surrounding bldg floor; refusal at 6'	10/17/00	10.0	2 - 10 '	4 "
C	IR-25	IR25VW6-08A	VEW	10/11/00	10/11/00	10		10/18/00	10.0	2 - 10 '	4 "
C	IR-25	IR25VW6-09A	VEW	10/10/00	10/10/00	10		10/16/00	10.0	2 - 10 '	4 "
C	IR-25	IR25VW6-10A	VEW	10/10/00	10/10/00	10		10/11/00	10.0	2 - 10 '	4 "
C	IR-25	IR25VW6-11A	VEW	10/11/00	10/11/00	10		10/18/00	10.0	2 - 10 '	4 "
C	IR-25	IR25VW6-12A	VEW	10/9/00	10/9/00	10		10/17/00	10.0	1.5 - 9.5 '	4 "
C	IR-25	IR25VW6-13A	VEW	10/10/00	10/10/00	10		10/17/00	10.0	1.5 - 9.5 '	4 "
C	IR-25	IR25VW6-14A	VEW	10/5/00	10/5/00	10		10/9/00	10.0	2 - 10 '	4 "
C	IR-25	IR25VW6-15A	VEW	10/9/00	10/9/00	10		10/11/00	10.0	2 - 10 '	4 "
C	IR-25	IR25VW6-16A	VEW	10/5/00	10/5/00	10		10/5/00	10.0	2 - 10 '	4 "
C	IR-25	IR25VW6-17A	VEW	10/9/00	10/9/00	10		10/11/00	10.0	2 - 10 '	4 "
C	IR-25	IR25VW6-18A	VEW	10/4/00	10/4/00	3.83	Refusal at 3 ' 10 "	10/9/00	10.0	2 - 10 '	4 "
C	IR-25	IR25VW6-19A	VEW	10/12/00	10/12/00	6	In sump 4' below surrounding bldg floor - hand sample	10/17/00	10.0	2 - 10 '	4 "
Vapor Monitoring Points (Lower Zone)											
C	IR-25	IR25SG042-10	VMP-L	10/12/00	10/12/00	10		10/18/00	10.0	6 - 10 '	2 "
C	IR-25	IR25SG043-10	VMP-L	10/11/00	10/11/00	10		10/19/00	10.0	6 - 10 '	2 "
C	IR-25	IR25SG044-10	VMP-L	10/12/00	10/12/00	6.5	In sump 3.5' below surrounding bldg floor	10/17/00	10.0	6 - 10 '	2 "
C	IR-25	IR25SG045-10	VMP-L	10/12/00	10/12/00	10		10/24/00	10.0	6 - 10 '	2 "
C	IR-25	IR25SG046-10	VMP-L	10/12/00	10/12/00	10		10/24/00	10.0	6 - 10 '	2 "
C	IR-25	IR25SG047-10	VMP-L	10/5/00	10/5/00	10		10/9/00	10.0	6 - 10 '	2 "
C	IR-25	IR25SG048-10	VMP-L	10/5/00	10/5/00	10		10/5/00	10.0	6 - 10 '	2 "
C	IR-25	IR25SG049-10	VMP-L	10/5/00	10/5/00	10		10/5/00	10.0	6 - 10 '	2 "
C	IR-25	IR25SG050-10	VMP-L	10/9/00	10/9/00	10		10/11/00	10.0	6 - 10 '	2 "
C	IR-25	IR25SG051-10	VMP-L	10/10/00	10/10/00	10		10/17/00	10.0	6 - 10 '	2 "
C	IR-25	IR25SG052-10	VMP-L	10/9/00	10/9/00	10		10/11/00	10.0	6 - 10 '	2 "
C	IR-25	IR25SG053-10	VMP-L	10/9/00	10/9/00	10	Push to refusal at 5' on first try; moved over & pushed to 10'	10/10/00	10.0	6 - 10 '	2 "
C	IR-25	IR25SG054-10	VMP-L	10/10/00	10/10/00	3	Refusal at 3 '	NA	NA	NA	NA

Soil Vapor Well Construction As-Builts											
				Direct Push / Continuous soil sampling				Well Completion			
C	IR-25	IR25SG055-10	VMP-L	10/9/00	10/9/00	10		10/11/00	10.0	6 - 10 '	2 "
C	IR-25	IR25SG056-10	VMP-L	10/4/00	10/4/00	10		10/5/00	10.0	6 - 10 '	2 "
C	IR-25	IR25SG057-10	VMP-L	10/4/00	10/4/00	10		10/9/00	10.0	6 - 10 '	2 "
C	IR-25	IR25SG058-10	VMP-L	10/4/00	10/4/00	10		10/4/00	10.0	6 - 10 '	2 "
C	IR-25	IR25SG059-10	VMP-L	10/4/00	10/4/00	10		10/10/00	10.0	6 - 10 '	2 "
C	IR-25	IR25SG060-10	VMP-L	10/5/00	10/5/00	10		10/10/00	10.0	6 - 10 '	2 "
C	IR-25	IR25SG061-10	VMP-L	10/5/00	10/5/00	10		10/10/00	10.0	6 - 10 '	2 "
C	IR-25	IR25SG062-10	VMP-L	10/4/00	10/4/00	10		10/4/00	10.0	6 - 10 '	2 "
C	IR-25	IR25SG063-10	VMP-L	10/10/00	10/10/00	10		10/11/00	10.0	6 - 10 '	2 "
C	IR-25	IR25SG064-10	VMP-L	10/10/00	10/10/00	10		10/11/00	10.0	6 - 10 '	2 "
C	IR-25	IR25SG065-10	VMP-L	10/10/00	10/10/00	10		10/25/00	10.0	6 - 10 '	2 "
Vapor Monitoring Points (Upper Zone)											
C	IR-25	IR25SG042-5	VMP-U	[redacted]				10/18/00	5.0	3 - 5 '	2 "
C	IR-25	IR25SG043-5	VMP-U					10/19/00	5.0	3 - 5 '	2 "
C	IR-25	IR25SG044-5	VMP-U					10/17/00	5.0	3 - 5 '	2 "
C	IR-25	IR25SG045-5	VMP-U					10/24/00	5.0	3 - 5 '	2 "
C	IR-25	IR25SG046-5	VMP-U					10/24/00	5.0	3 - 5 '	2 "
C	IR-25	IR25SG047-5	VMP-U					10/9/00	5.0	3 - 5 '	2 "
C	IR-25	IR25SG048-5	VMP-U					10/5/00	5.0	3 - 5 '	2 "
C	IR-25	IR25SG049-5	VMP-U					10/5/00	5.0	3 - 5 '	2 "
C	IR-25	IR25SG050-5	VMP-U					10/11/00	5.0	3 - 5 '	2 "
C	IR-25	IR25SG051-5	VMP-U					10/17/00	5.0	3 - 5 '	2 "
C	IR-25	IR25SG052-5	VMP-U					10/11/00	5.0	3 - 5 '	2 "
C	IR-25	IR25SG053-5	VMP-U					10/10/00	5.0	3 - 5 '	2 "
C	IR-25	IR25SG054-5	VMP-U					NA	NA	NA	NA
C	IR-25	IR25SG055-5	VMP-U					10/11/00	5.0	3 - 5 '	2 "
C	IR-25	IR25SG056-5	VMP-U					10/5/00	5.0	3 - 5 '	2 "
C	IR-25	IR25SG057-5	VMP-U					10/9/00	5.0	3 - 5 '	2 "
C	IR-25	IR25SG058-5	VMP-U					10/4/00	5.0	3 - 5 '	2 "
C	IR-25	IR25SG059-5	VMP-U					10/9/00	5.0	3 - 5 '	2 "
C	IR-25	IR25SG060-5	VMP-U					10/10/00	5.0	3 - 5 '	2 "
C	IR-25	IR25SG061-5	VMP-U					10/10/00	5.0	3 - 5 '	2 "
C	IR-25	IR25SG062-5	VMP-U					10/4/00	5.0	3 - 5 '	2 "
C	IR-25	IR25SG063-5	VMP-U					10/11/00	5.0	3 - 5 '	2 "
C	IR-25	IR25SG064-5	VMP-U					10/11/00	5.0	3 - 5 '	2 "
C	IR-25	IR25SG065-5	VMP-U					10/25/00	5.0	3 - 5 '	2 "
Explanations:											
One soil boring was performed at each vapor monitoring well location											
VEW = vapor extraction well											

[redacted]
same as lower zone wells
SEE EXPLANATIONS BELOW

Soil Vapor Well Construction As-Builts										
				Direct Push / Continuous soil sampling			Well Completion			
VMP-L = vapor monitoring well installed in lower or deeper zone										
VMP-U = vapor monitoring well installed in shallower or upper zone										
NA = Not applicable -- only one well was installed due to site conditions										

Appendix A-1 Soil Vapor Well Construction As-Builts (Cont'd)											
				Direct Push / Continuous soil sampling				Well Completion			
Vapor Extraction Wells											
Parcel	IR	Well No.	Well Type	Boring drill date	Date Soil samples collected/shipped	TD of boring (feet bgs)	Comments	Date of Well completion	Well TD	Screen Interval	Well Diameter (in.)
C	IR-28	IR28VW2-15A	VEW	10/31/00	10/31/00	7		11/7/00	6.0	2 - 6 '	4 "
C	IR-28	IR28VW2-16A	VEW	10/31/00	10/31/00	7		11/7/00	6.0	2 - 6 '	4 "
C	IR-28	IR28VW2-17A	VEW	10/31/00	10/31/00	7		11/8/00	6.0	2 - 6 '	4 "
C	IR-28	IR28VW2-18A	VEW	10/31/00	10/31/00	7		11/8/00	6.0	2 - 6 '	4 "
C	IR-28	IR28VW2-19A	VEW	11/1/00	11/1/00	7		11/7/00	6.0	2 - 6 '	4 "
Vapor Monitoring Points (Lower Zone)											
C	IR-28	IR28SG420	VMP-L	11/1/00	11/1/00	7		11/9/00	6.0	4 - 6 '	2 "
C	IR-28	IR28SG421	VMP-L	10/31/00	10/31/00	7		11/8/00	6.0	4 - 6 '	2 "
C	IR-28	IR28SG422	VMP-L	10/30/00	10/30/00	7		11/8/00	6.0	4 - 6 '	2 "
C	IR-28	IR28SG423	VMP-L	10/30/00	10/30/00	5.5	Refusal at 5.5 '	11/8/00	6.0	4 - 6 '	2 "
C	IR-28	IR28SG424	VMP-L	11/1/00	11/1/00	7		11/9/00	6.0	4 - 6 '	2 "
C	IR-28	IR28SG425	VMP-L	10/31/00	10/31/00	7		11/9/00	6.0	4 - 6 '	2 "
C	IR-28	IR28SG426	VMP-L	10/31/00	10/31/00	7		11/8/00	6.0	4 - 6 '	2 "
C	IR-28	IR28SG427	VMP-L	11/1/00	11/1/00	3.83	In sump 3' below surrounding bldg floor - hand sample	11/7/00	3.0	2 - 3 '	2 "
C	IR-28	IR28SG428	VMP-L	10/31/00	10/31/00	7		11/9/00	6.0	4 - 6 '	2 "
C	IR-28	IR28SG429	VMP-L	11/1/00	11/1/00	2.5	In sump 3' below surrounding bldg floor - hand sample	11/13/00	3.0	2 - 3 '	2 "
C	IR-28	IR28SG430	VMP-L	11/1/00	11/1/00	2.16	In sump 3' below surrounding bldg floor - hand sample	11/7/00	3.0	2 - 3 '	2 "
C	IR-28	IR28SG431	VMP-L	10/31/00	10/31/00	7		11/7/00	6.0	4 - 6 '	2 "
C	IR-28	IR28SG432	VMP-L	11/1/00	11/1/00	7		11/7/00	6.0	4 - 6 '	2 "
Vapor Monitoring Points (Upper Zone)											
C	IR-28	IR28SG420	VMP-U	[redacted]				11/9/00	3.5	2 - 3.5 '	2 "
C	IR-28	IR28SG421	VMP-U					11/8/00	3.5	2 - 3.5 '	2 "
C	IR-28	IR28SG422	VMP-U					11/8/00	3.5	2 - 3.5 '	2 "
C	IR-28	IR28SG423	VMP-U					11/8/00	3.5	2 - 3.5 '	2 "
C	IR-28	IR28SG424	VMP-U					11/9/00	3.5	2 - 3.5 '	2 "
C	IR-28	IR28SG425	VMP-U					11/9/00	3.5	2 - 3.5 '	2 "
C	IR-28	IR28SG426	VMP-U					11/8/00	3.5	2 - 3.5 '	2 "

[redacted]

Appendix A-1 Soil Vapor Well Construction As-Builts (Cont'd)											
				Direct Push / Continuous soil sampling				Well Completion			
C	IR-28	IR28SG427	VMP-U	[redacted]				NA	NA	NA	NA
C	IR-28	IR28SG428	VMP-U					11/9/00	3.5	2 - 3.5 '	2 "
C	IR-28	IR28SG429	VMP-U					NA	NA	NA	NA
C	IR-28	IR28SG430	VMP-U					NA	NA	NA	NA
C	IR-28	IR28SG431	VMP-U					11/7/00	3.5	2 - 3.5 '	2 "
C	IR-28	IR28SG432	VMP-U					11/7/00	3.5	2 - 3.5 '	2 "

Explanations:

One soil boring was performed at each vapor monitoring well location

VEW = vapor extraction well

VMP-L = vapor monitoring well installed in lower or deeper zone

VMP-U = vapor monitoring well installed in shallower or upper zone

NA = Not applicable -- only one well was installed due to site conditions

Appendix A-1 Soil Vapor Well Construction As-Builts (Cont'd)

				Direct Push / Continuous soil sampling				Well Completion			
Vapor Extraction Wells											
Parcel	IR	Well No.	Well Type	Boring drill date	Date Soil samples collected/shipped	TD of boring (feet bgs)	Comments	Date of Well completion	Well TD	Screen Interval	Well Diameter (in.)
C	IR-28	IR28VW5-01A	VEW	10/25/00	10/25/00	7		11/1/00	6.0	2 - 6 '	4 "
C	IR-28	IR28VW5-02A	VEW	10/24/00	10/24/00	7		11/1/00	6.0	2 - 6 '	4 "
C	IR-28	IR28VW5-03A	VEW	10/30/00	10/30/00	5	In sump 3' below surrounding bldg floor	11/2/00	3.0	2 - 6 '	4 "
C	IR-28	IR28VW5-04A	VEW	10/24/00	10/24/00	7		11/6/00	6.0	2 - 6 '	4 "
C	IR-28	IR28VW5-05A	VEW	10/24/00	10/24/00	7		11/6/00	6.0	2 - 6 '	4 "
C	IR-28	IR28VW5-06A	VEW	10/30/00	10/30/00	8		11/6/00	6.0	2 - 6 '	4 "
Vapor Monitoring Points (Lower Zone)											
C	IR-28	IR28SG452	VMP-L	10/24/00	10/24/00	7		11/1/00	6.0	4 - 6 '	2 "
C	IR-28	IR28SG453	VMP-L	10/26/00	10/26/00	3.25	In sump 3' below surrounding bldg floor - hand sample	11/2/00	3.0	2 - 3 '	2 "
C	IR-28	IR28SG454	VMP-L	10/25/00	10/25/00	7		11/6/00	6.0	4 - 6 '	2 "
C	IR-28	IR28SG455	VMP-L	10/26/00	10/26/00	3.33	In sump 3' below surrounding bldg floor - hand sample	11/2/00	3.5	2 - 3.5 '	2 "
C	IR-28	IR28SG456	VMP-L	10/24/00	10/24/00	7		11/6/00	6.0	4 - 6 '	2 "
C	IR-28	IR28SG457	VMP-L	10/26/00	10/26/00	7		11/6/00	6.0	4 - 6 '	2 "
C	IR-28	IR28SG458	VMP-L	10/24/00	10/24/00	7		11/1/00	6.0	4 - 6 '	2 "
C	IR-28	IR28SG459B	VMP-L	10/26/00	10/26/00	5	In sump 3' below surrounding bldg floor	11/2/00	3.0	2 - 3 '	2 "
C	IR-28	IR28SG460	VMP-L	10/26/00	10/26/00	5	In sump 3' below surrounding bldg floor	11/2/00	3.0	2 - 3 '	2 "
C	IR-28	IR28SG461	VMP-L	10/24/00	10/24/00	7		11/6/00	6.0	4 - 6 '	2 "
C	IR-28	IR28SG462	VMP-L	10/25/00	10/25/00	7		11/2/00	6.0	4 - 6 '	2 "
C	IR-28	IR28SG463	VMP-L	10/25/00	10/25/00	7		11/2/00	6.0	4 - 6 '	2 "
C	IR-28	IR28SG464	VMP-L	10/25/00	10/25/00	7		11/1/00	6.0	4 - 6 '	2 "
Vapor Monitoring Points (Upper Zone)											
C	IR-28	IR28SG452	VMP-U	[redacted]				11/1/00	3.5	2 - 3.5 '	2 "
C	IR-28	IR28SG453	VMP-U					NA	NA	NA	NA
C	IR-28	IR28SG454	VMP-U					11/6/00	3.5	2 - 3.5 '	2 "
C	IR-28	IR28SG455	VMP-U					NA	NA	NA	NA
C	IR-28	IR28SG456	VMP-U					11/6/00	3.5	2 - 3.5 '	2 "
C	IR-28	IR28SG457	VMP-U					11/6/00	3.5	2 - 3.5 '	2 "

[redacted] lower zone wells

Appendix A-1 Soil Vapor Well Construction As-Builts (Cont'd)											
				Direct Push / Continuous soil sampling			Well Completion			
C	IR-28	IR28SG458	VMP-U	[redacted]			11/1/00	3.5	2 - 3.5 '	2 "
C	IR-28	IR28SG459	VMP-U				NA	NA	NA	NA
C	IR-28	IR28SG460	VMP-U				NA	NA	NA	NA
C	IR-28	IR28SG461	VMP-U				11/6/00	3.5	2 - 3.5 '	2 "
C	IR-28	IR28SG462	VMP-U				11/2/00	3.5	2 - 3.5 '	2 "
C	IR-28	IR28SG463	VMP-U				11/2/00	3.5	2 - 3.5 '	2 "
C	IR-28	IR28SG464	VMP-U				11/1/00	3.5	2 - 3.5 '	2 "

Explanations:

One soil boring was performed at each vapor monitoring well location

VEW = vapor extraction well

VMP-L = vapor monitoring well installed in lower or deeper zone

VMP-U = vapor monitoring well installed in shallower or upper zone

NA = Not applicable -- only one well was installed due to site conditions

ATTACHMENT 2
BASELINE WELLHEAD VAPOR CONCENTRATIONS FOR SVE WELLS AT IR25 (BUILDINGS 134, 211, AND 251)

Baseline Wellhead Vapor Concentrations
for SVE Wells at IR25 (Building 134)
Hunters Point Naval Shipyard, SF, CA

SVE Well ID	PID Reading (PPMv)	Analytical Data (PPMv)	Ratio of Field to Lab Results (a)
IR25VW6-3A	12.8	1.2	11
IR25VW6-4A	10.6	1.7	6
IR25VW6-5A	10.6	0.8	13
IR25VW6-6A	26.6	5.8	5
IR25VW6-7A	18	1.1	16
IR25VW6-8A	12.2	0.5	23
IR25VW6-9A	19.8	1.2	17
IR25VW6-10A	22.1	1.0	23
IR25VW6-11A	10.3	0.6	18
IR25VW6-12A	20.6	0.9	23
IR25VW6-13A	90.1	3.9	23
IR25VW6-14A	8.4	0.6	14
IR25VW6-15A	60.3	0.4	155
IR25VW6-16A	8	0.4	18
IR25VW6-17A	27	6.2	4
IR25VW6-18A	27.5	7.8	4
IR25VW6-19A	47.6	6.3	8

Note:

(a) The ratio of field to lab results for the vapor sample collected at each SVE well is determined by dividing the PID reading by the laboratory data.

Baseline Wellhead Vapor Concentrations
for SVE Wells at IR28 (Building 211)
Hunters Point Naval Shipyard, SF, CA

SVE Well ID	PID Reading (PPMv)	Laboratory Results of Detected VOC (PPMv)				Total Detected VOC (PPMv) (a)	Ratio of Field to Lab Results (b)
		2-Butanone	cis-1,2-Dichloroethene	Toluene	Trichloroethene		
IR28VW2-15A	0	0.36	0.012	0.032	0.137	0.541	0.0
IR28VW2-16A	9.7	ND	0.194	ND	3.16	3.354	2.9
IR28VW2-17A	3.8	0.337	ND	ND	1.54	1.877	2.0
IR28VW2-18A	8.6	0.21	0.158	ND	1.87	2.238	3.8
IR28VW2-19A	11.8	0.313	0.422	ND	3.97	4.705	2.5

Explanations:

(a) The total volatile organic concentration is the sum of the concentrations of only detected volatile organic compounds (VOC), including those with "J" qualifier.

(b) The ratio of field to lab results for the vapor sample collected at each SVE well is determined by dividing the PID reading by the total volatile organic concentration measured in the offsite laboratory.

ND = Not detected at the method quatitation limit.

PPMv = Parts per million by volume

Baseline Wellhead Vapor Concentrations
for SVE Wells at IR28 (Building 251)
Hunters Point Naval Shipyard, SF, CA

SVE Well ID	PID Reading (PPMv)	Laboratory Results of Detected VOC (PPMv)					Total Detected VOC (PPMv) (a)	Ratio of Field to Lab Results (b)
		2-Butanone	Chlorobenzene	Tetrachloroethene	Toluene	Trichloroethene		
IR28VW5-01A	12.2	0.377	ND	0.039	0.013	ND	0.429	28.4
IR28VW5-02A	11.1	0.301	ND	0.391	0.017	0.036	0.745	14.9
IR28VW5-03A	247	3.59	0.972	ND	ND	ND	4.562	54.1
IR28VW5-04A	33.3	0.138	ND	0.59	ND	ND	0.728	45.7
IR28VW5-05A	19.4	0.409	ND	1.02	ND	ND	1.429	13.6
IR28VW5-06A	9	0.327	ND	0.027	0.013	ND	0.367	24.5

Explanations:

(a) The total volatile organic concentration is the sum of the concentrations of only detected volatile organic compounds (VOC), including those with "J" qualifier.

(b) The ratio of field to lab results for the vapor sample collected at each SVE well is determined by dividing the PID reading by the total volatile organic concentration measured in the offsite laboratory.

ND = Not detected at the method quatitation limit.

PPMv = Parts per million by volume

APPENDIX B
SVE SYSTEM PERFORMANCE PLOTS

Appendix B contains the following:

- Attachment 1: System Performance Plots for Building 134
- Attachment 2: System Performance Plots for Building 211
- Attachment 3: System Performance Plots for Building 251

ATTACHMENT 1
SYSTEM PERFORMANCE PLOTS FOR BUILDING 134

Figure 1 -- Plot of Vacuum vs. Extraction Airflow for SVE Wells During Step Test at IR25, Building 134, HPS, SF, CA

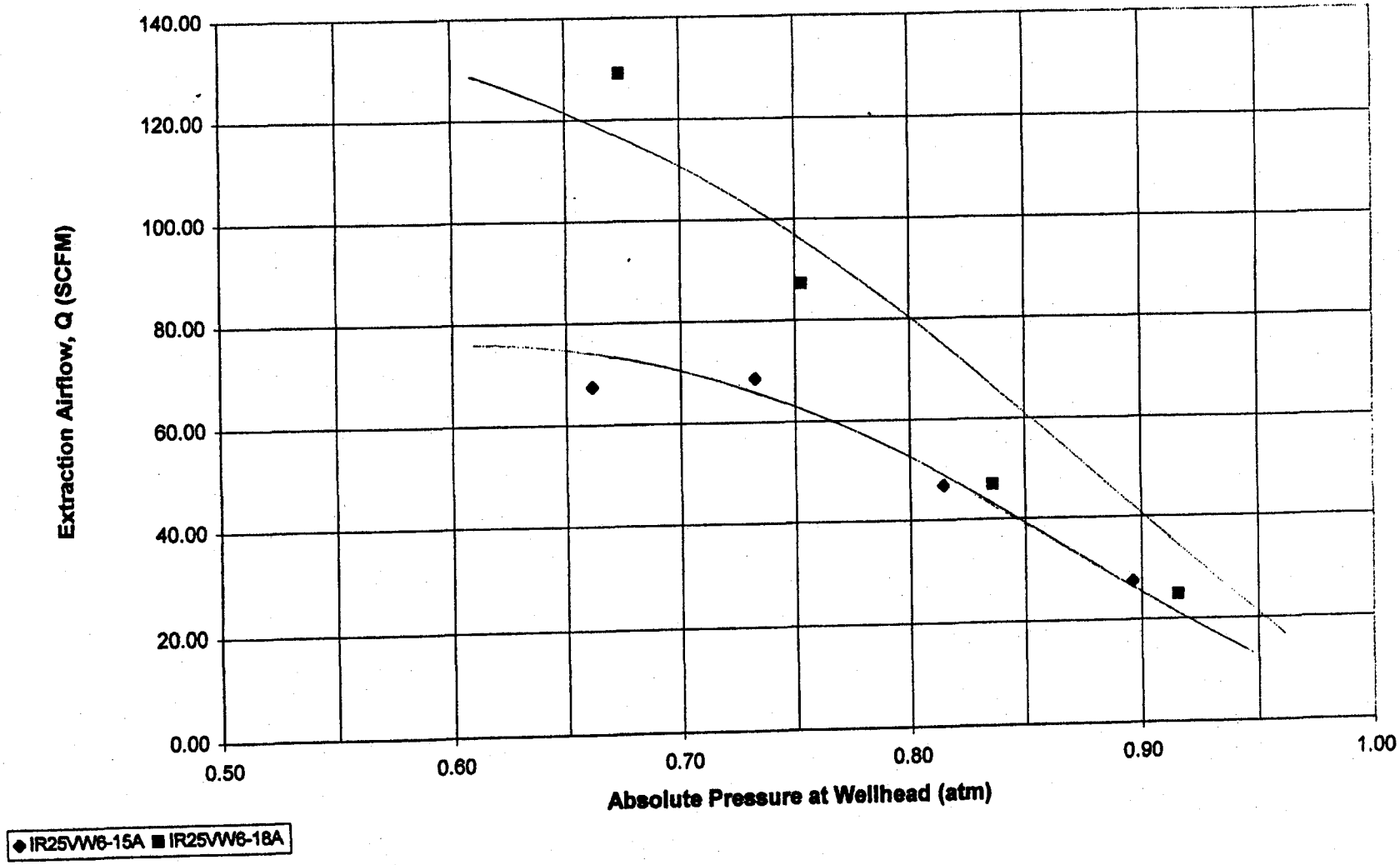


Figure 2 -- Plot of Influent Soil Vapor Concentration Over Hours of System Operation at IR25, Building 134, HPS, SF, CA

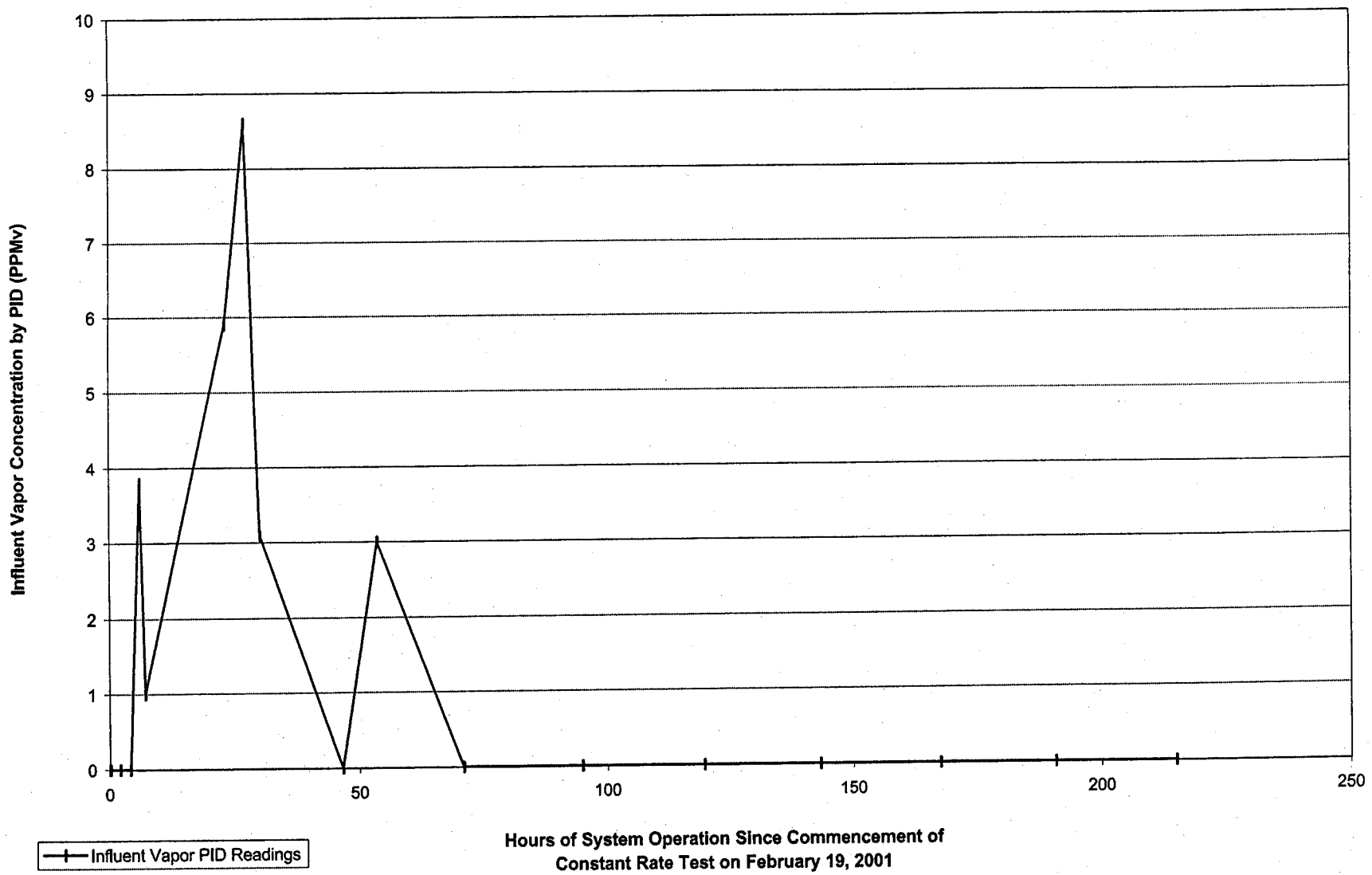


Figure 3 – Plot of VOC Mass Extraction Rate Over Hours of System Operation at IR25, Building 134, HPS, SF, CA

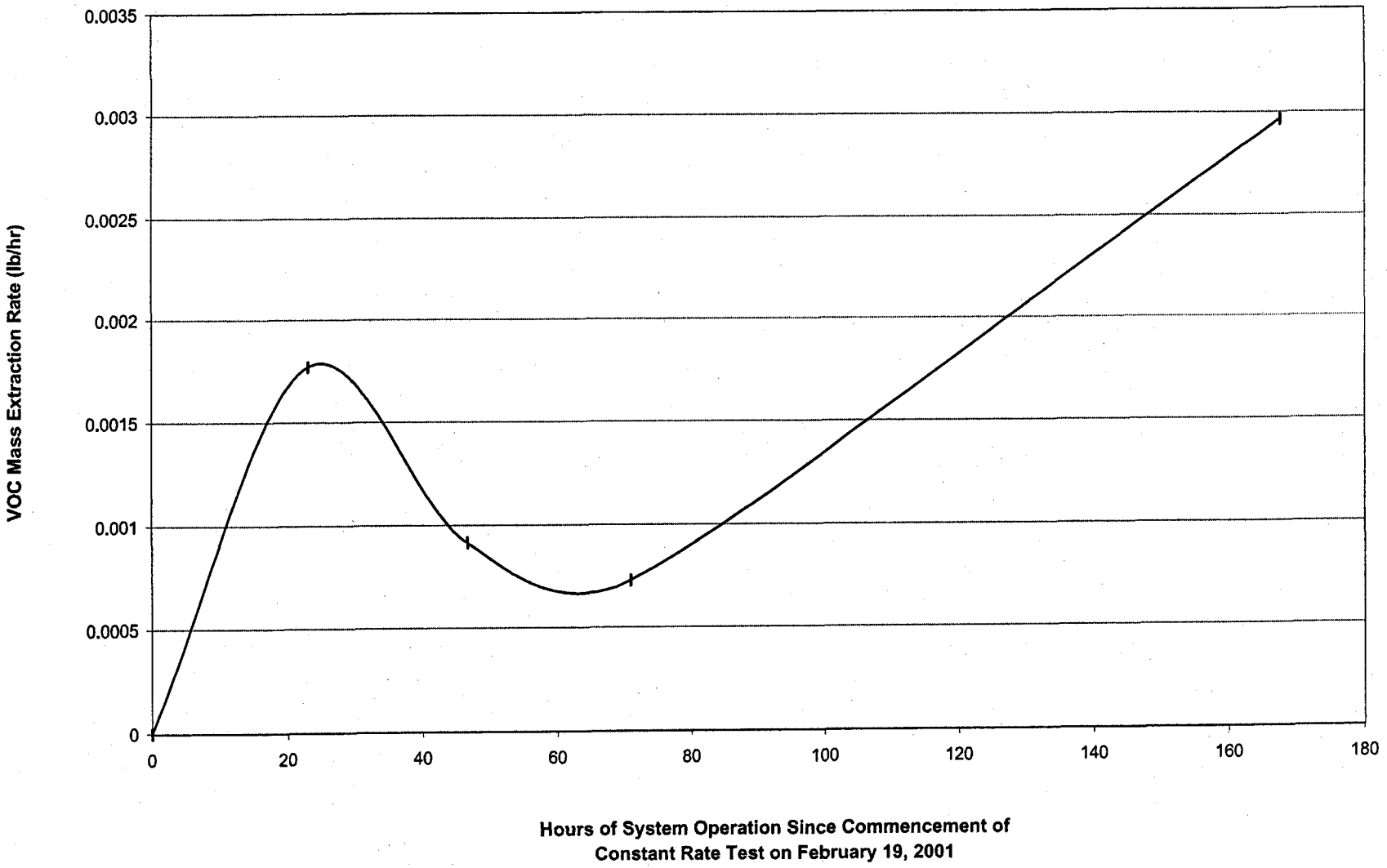


Figure 4 -- Plot of Cumulative VOC Mass Extraction Versus Hours of System Operation at IR25, Building 134, HPS, SF, CA

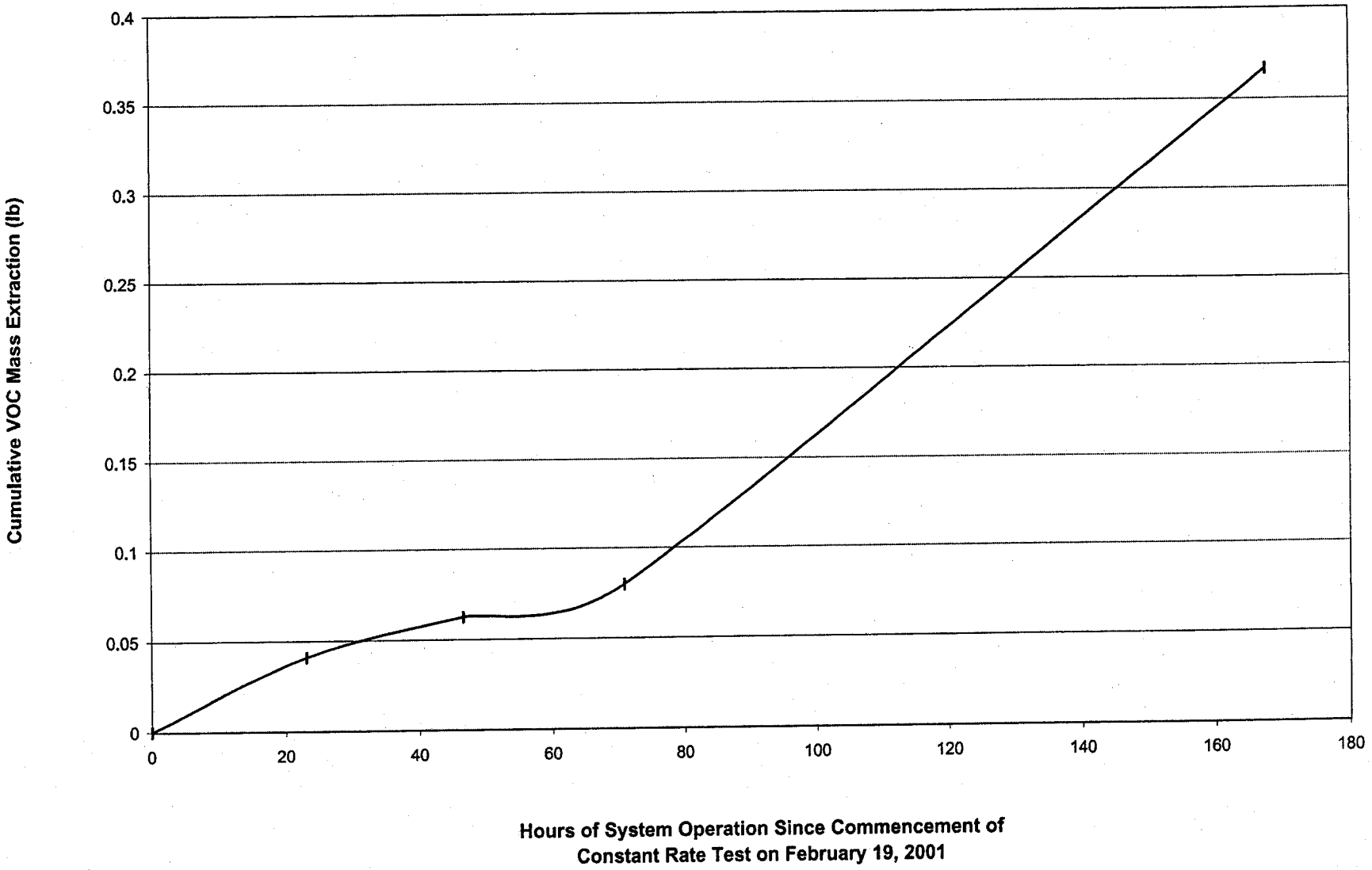


Figure 5 -- Plot of Carbon Treatment Unit Influent and Effluent Concentrations Versus Hours of System Operation at IR25, Building 134, HPS, SF, CA

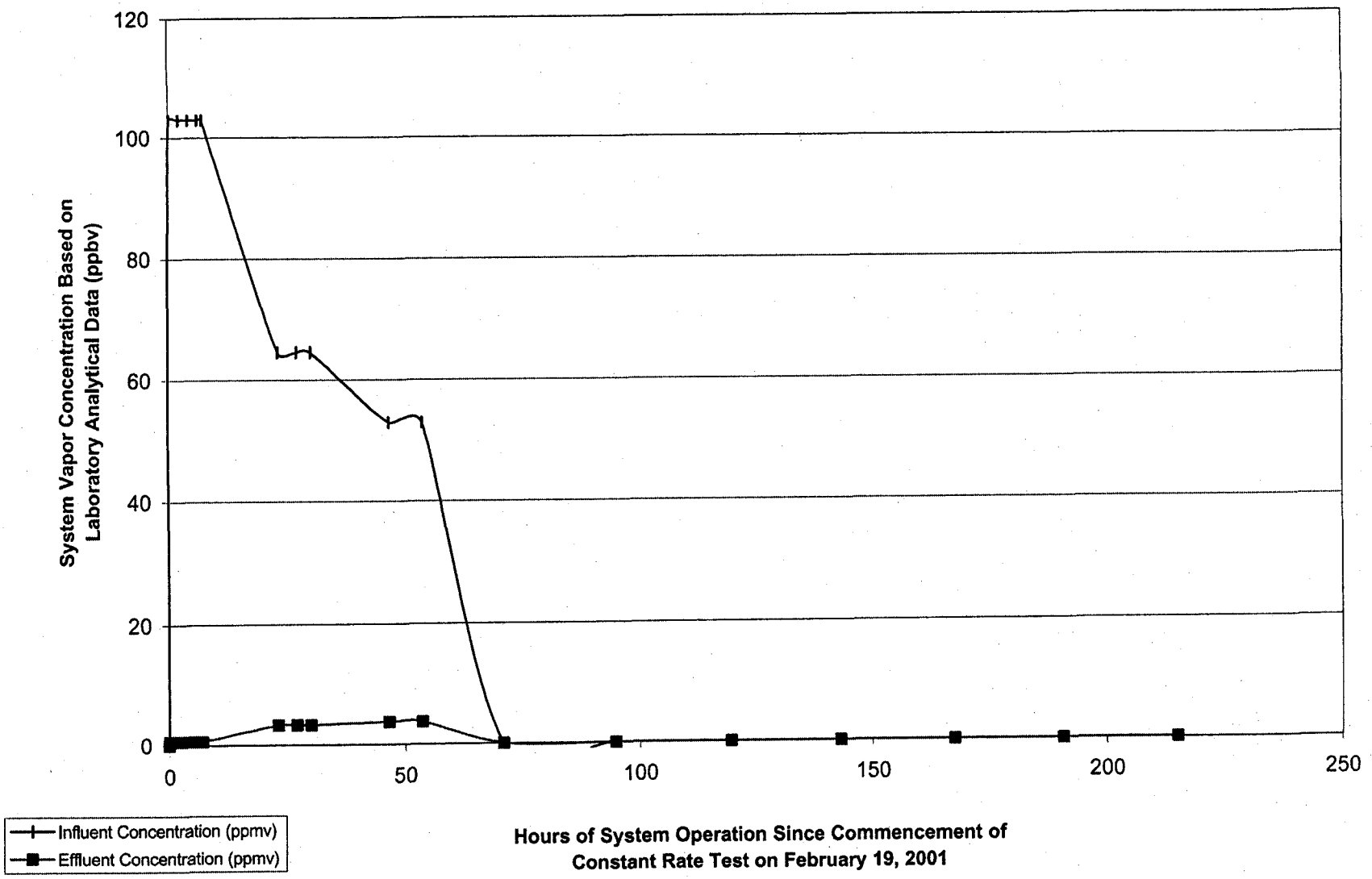
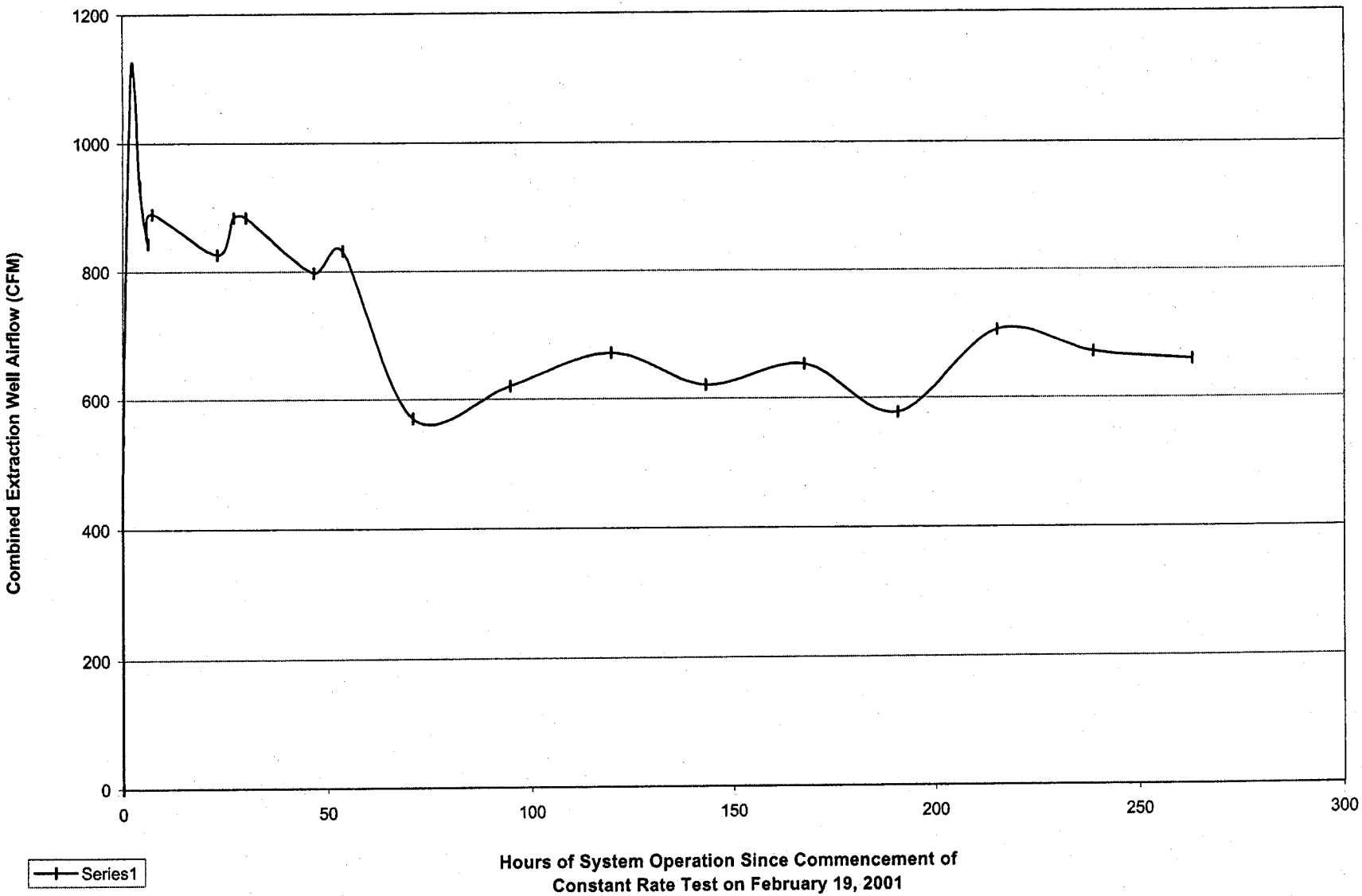


Figure X – Plot of Extraction Airflow Over Hours of System Operation at IR25, Building 134, HPS, SF, CA



ATTACHMENT 2
SYSTEM PERFORMANCE PLOTS FOR BUILDING 211

Figure 1 -- Plot of Vacuum vs. Extraction Airflow for SVE Wells During Step Test at IR28, Building 211, HPS, SF, CA

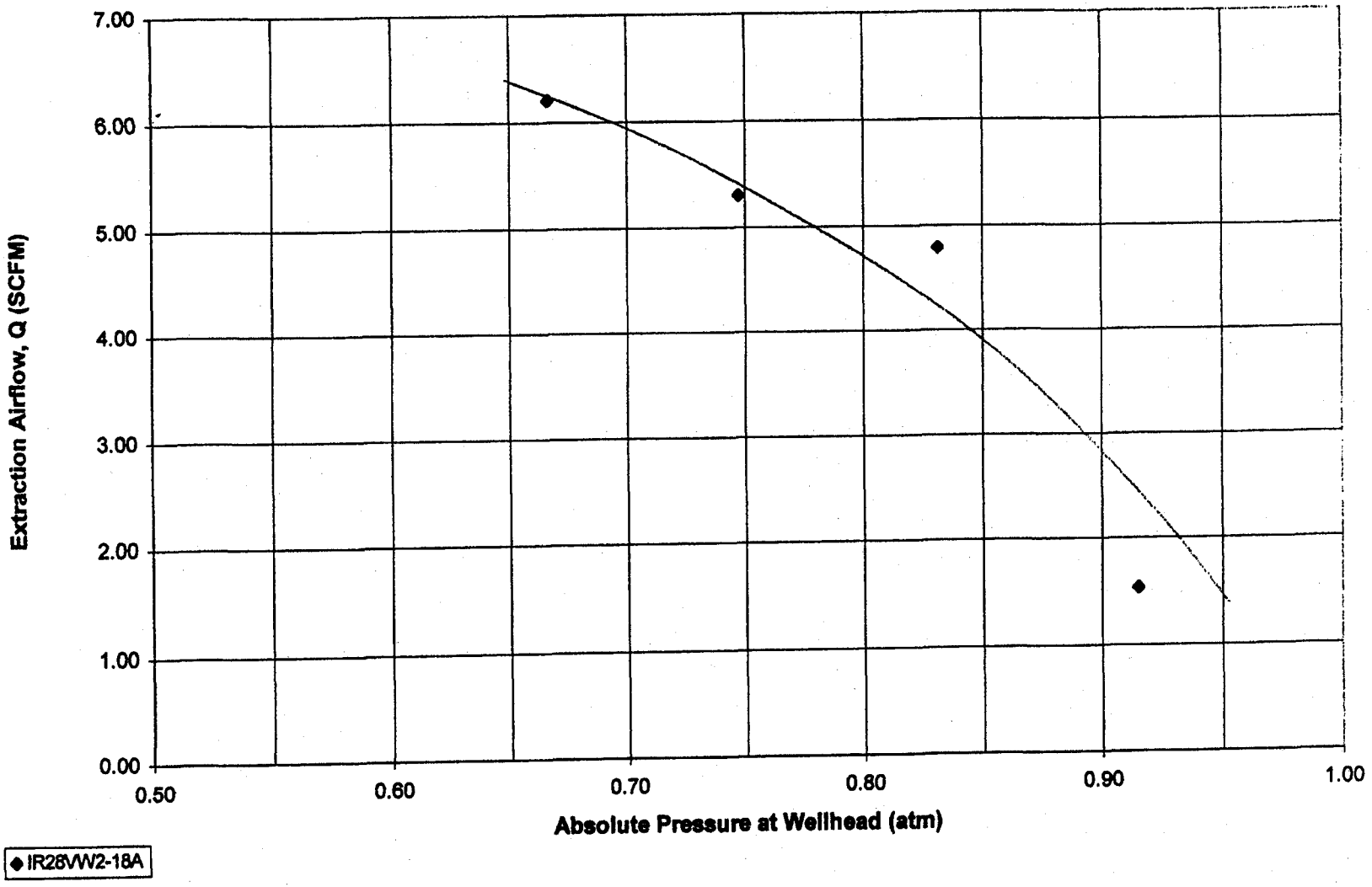


Figure 2 -- Plot of Influent Soil Vapor Concentration Over Hours of System Operation at IR28, Building 211, HPS, SF, CA

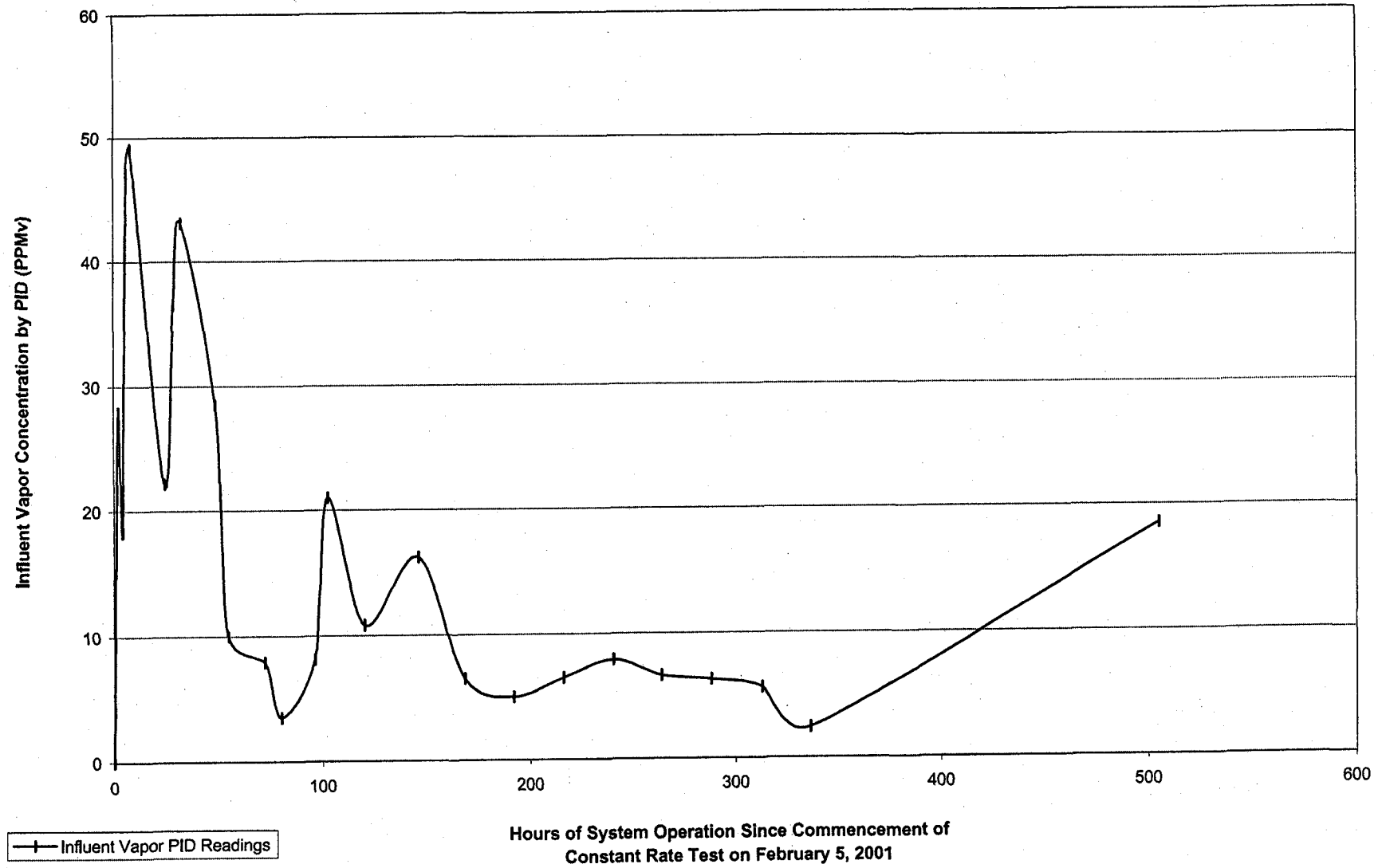


Figure 3 -- Plot of VOC Mass Extraction Rate Over Hours of System Operation at IR28, Building 211, HPS, SF, CA

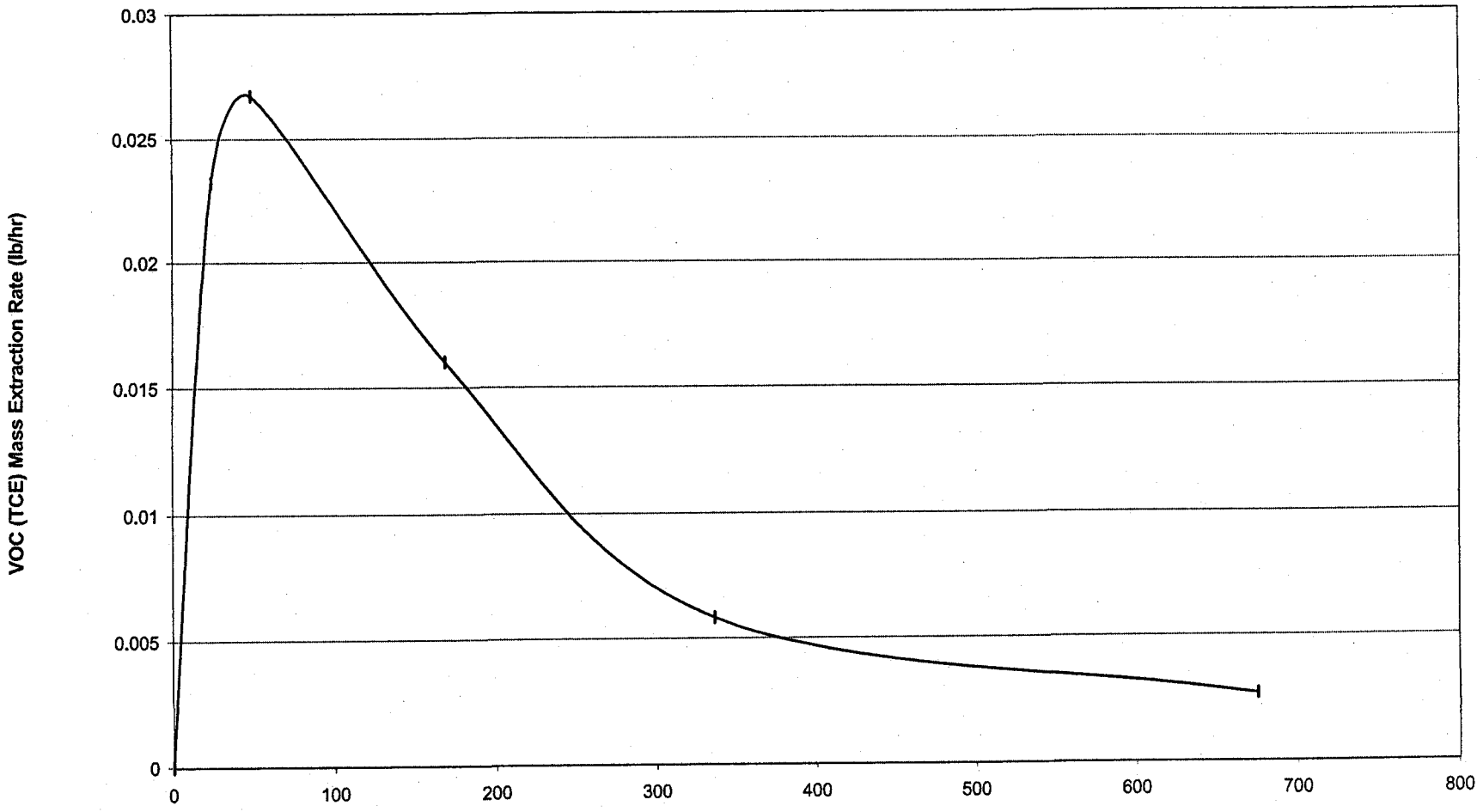


Figure 4 -- Plot of Cumulative VOC Mass Extraction Versus Hours of System Operation at IR28, Building 211, HPS, SF, CA

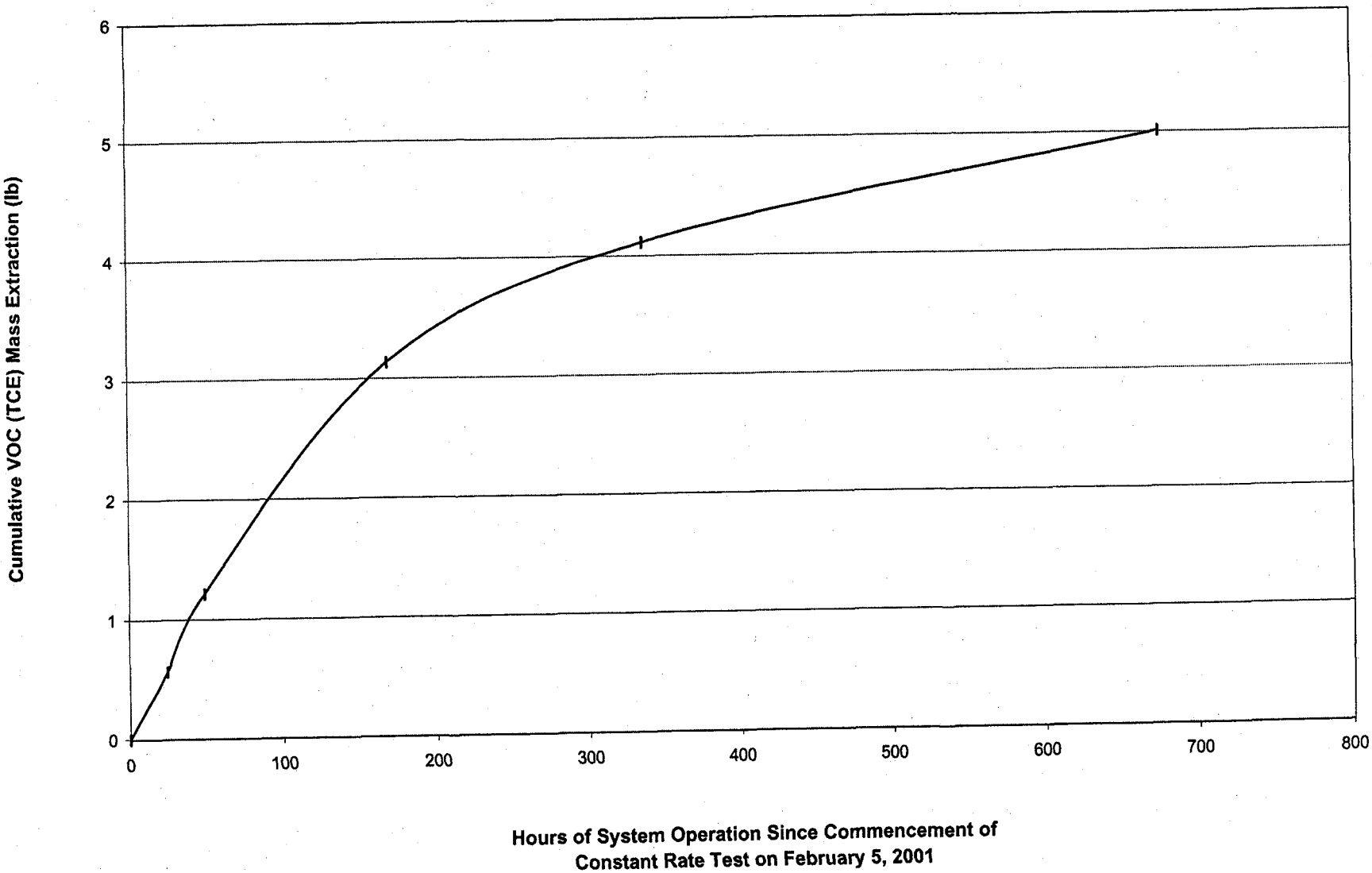
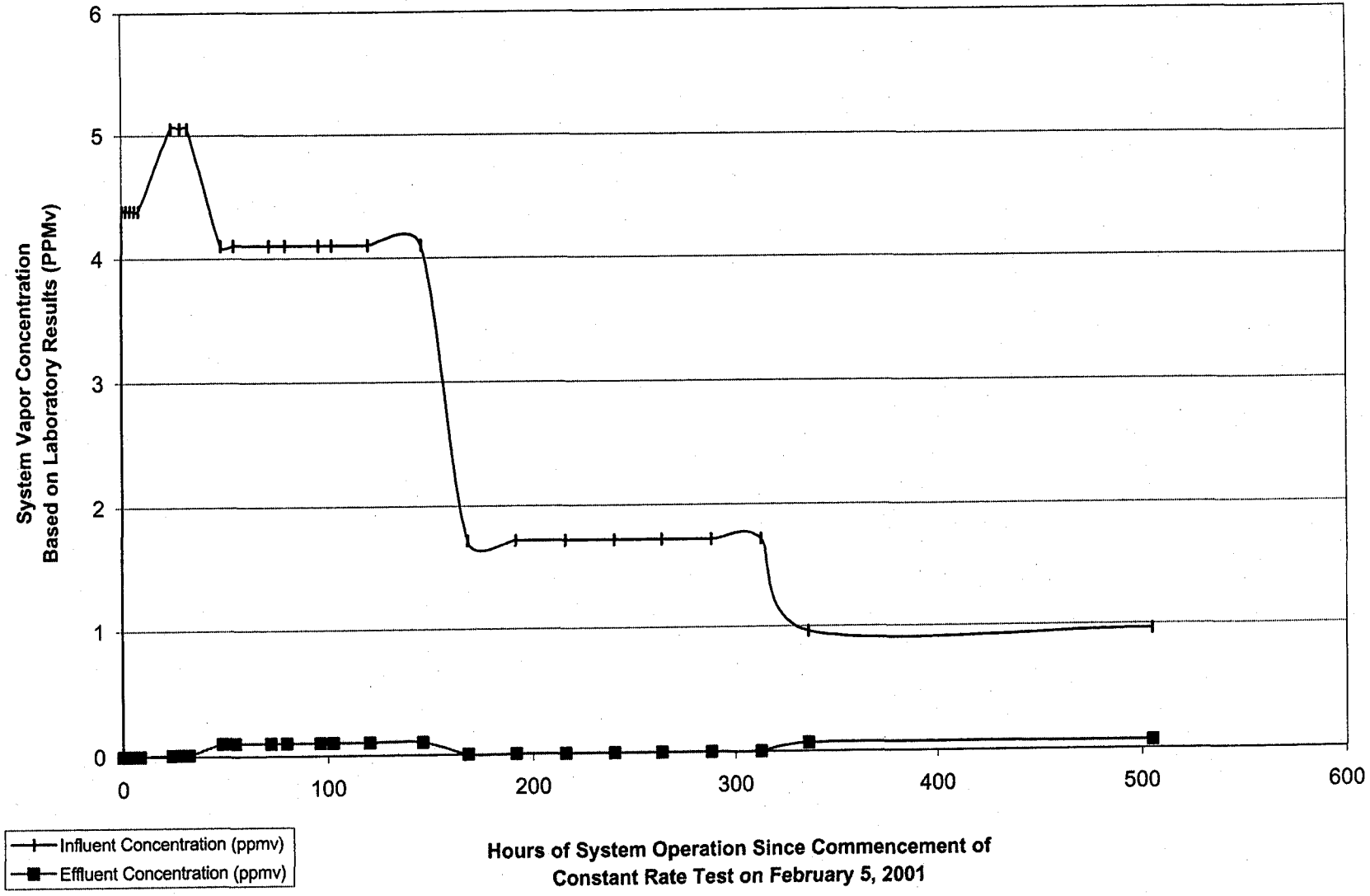


Figure 5 -- Plot of Carbon Treatment Unit Influent and Effluent Concentrations Versus Hours of System Operation at IR28, Building 211, HPS, SF, CA



ATTACHMENT 3
SYSTEM PERFORMANCE PLOTS FOR BUILDING 251

Figure 1 -- Plot of Vacuum vs. Extraction Airflow for SVE Wells During Step Test at IR28, Building 251, HPS, SF, CA

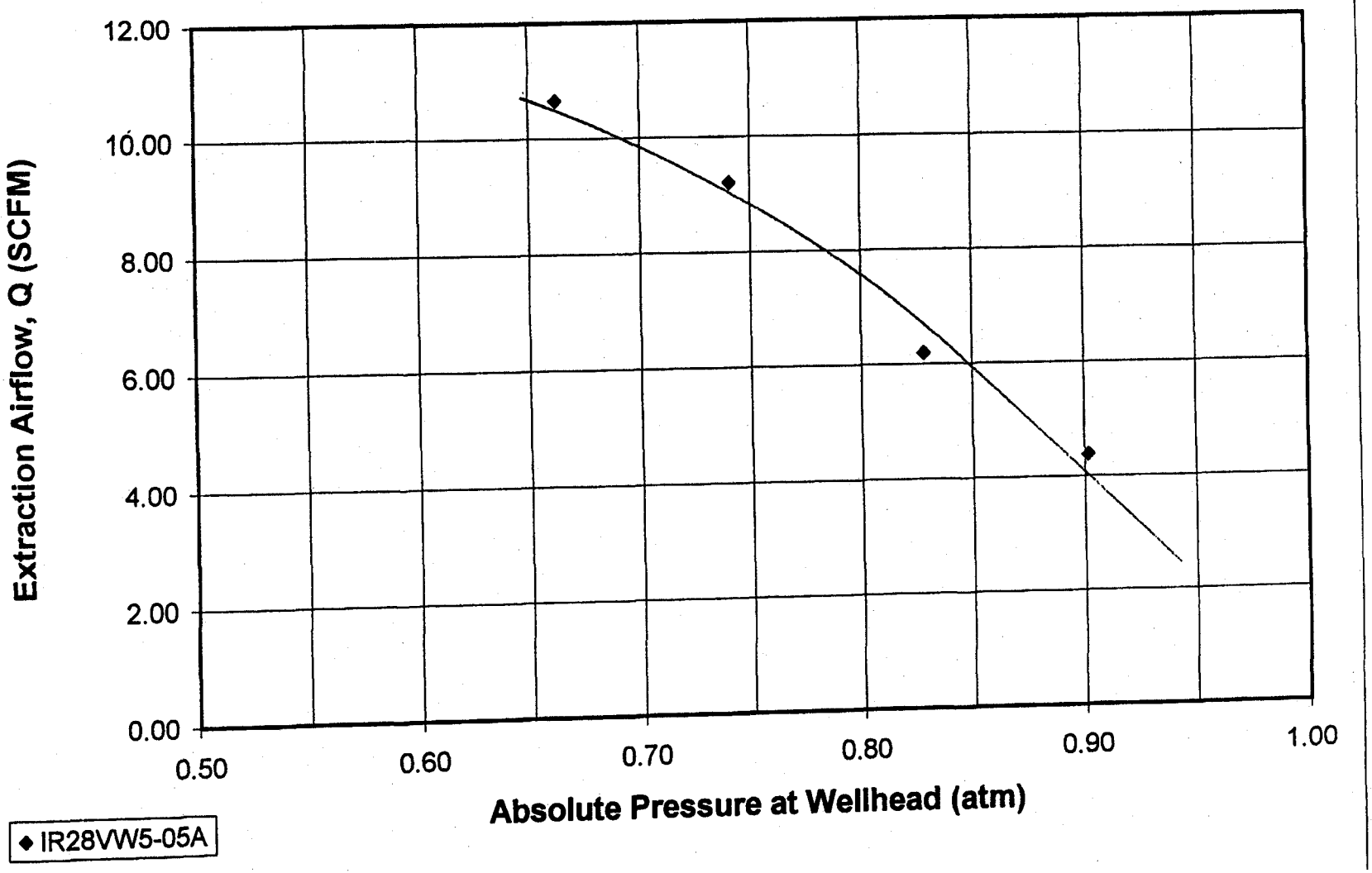


Figure 2 -- Plot of Influent Soil Vapor Concentration Over Hours of System Operation at IR28, Building 251, HPS, SF, CA

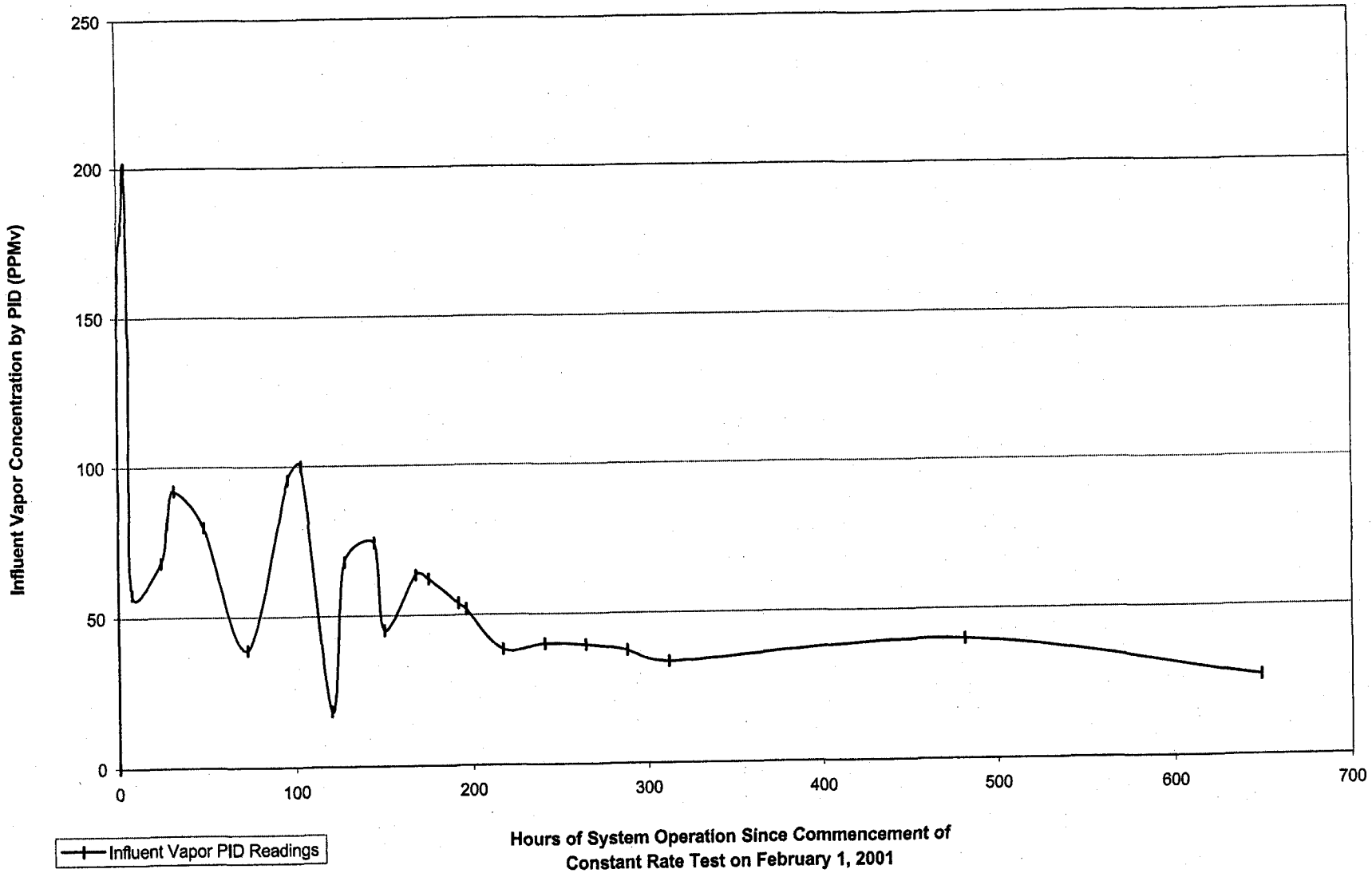


Figure 3 -- Plot of VOC Mass Extraction Rate Over Hours of System Operation at IR28, Building 251, HPS, SF, CA

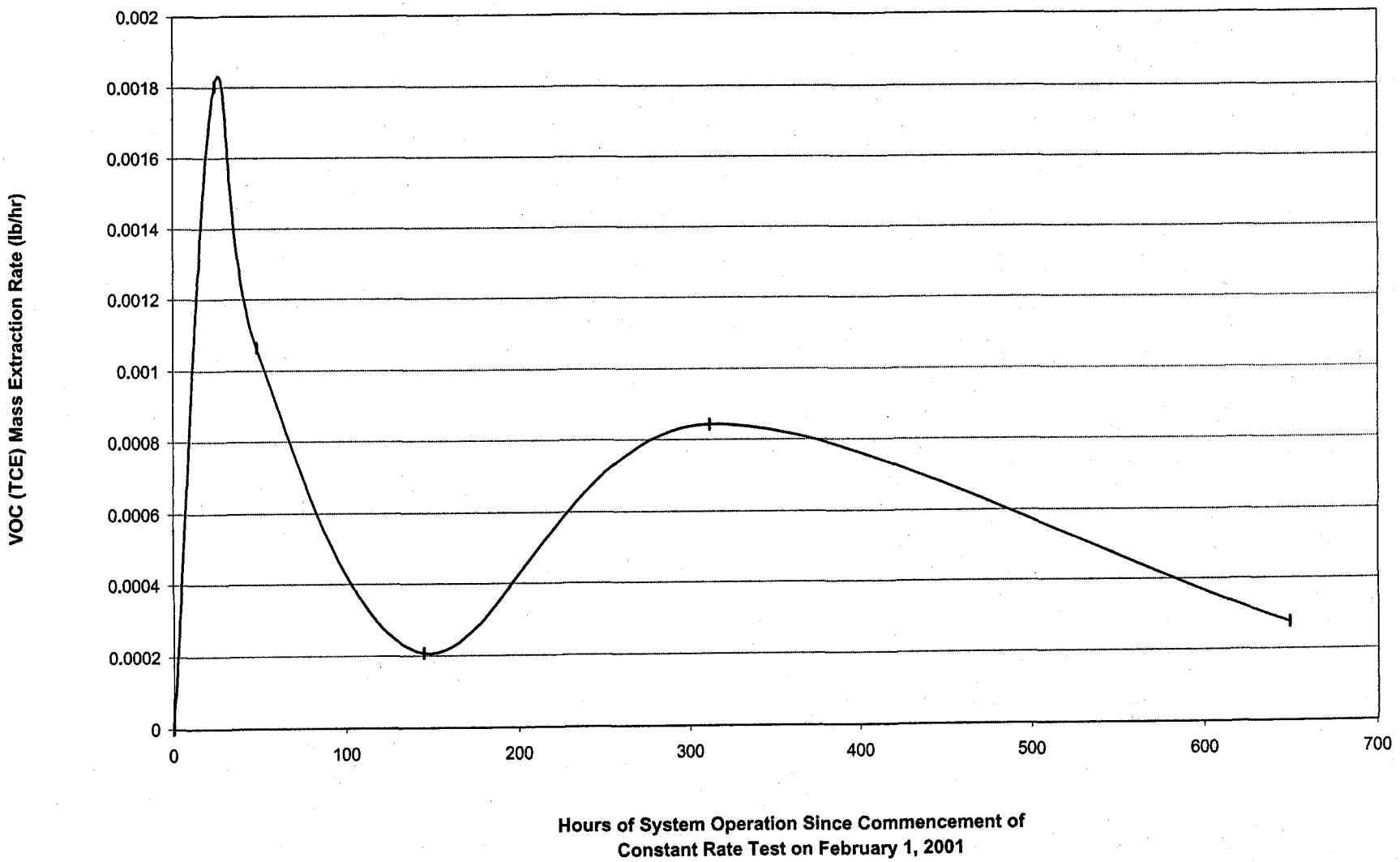


Figure 4 -- Plot of Cumulative VOC Mass Extraction Versus Hours of System Operation at IR28, Building 251, HPS, SF, CA

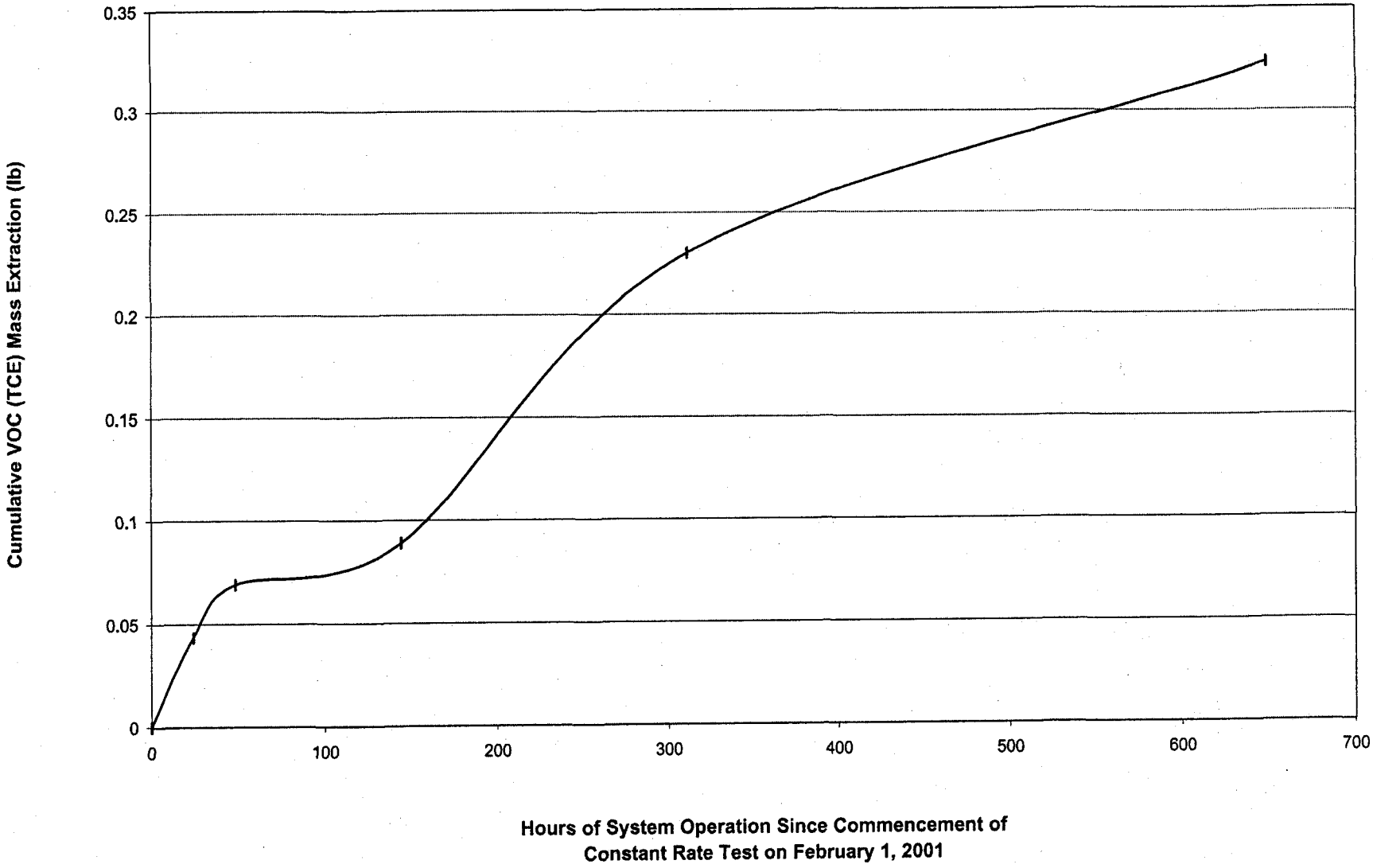


Figure 5 -- Plot of Carbon Treatment Unit Influent and Effluent Concentrations Versus Hours of System Operation at IR28, Building 251, HPS, SF, CA