OPERATIONAL PLAN

Prepared for:

BLACK & DECKER (U.S.) INC.
Hampstead, Maryland

JUNE 1995

Prepared by:

Roy F. Weston, Inc.
One Weston Way
West Chester, Pennsylvania 19380

W.O. No. 02501-004-001-0200

TABLE OF CONTENTS

TABLE OF CONTENTS
(Continued)

LIST OF TABLES

LIST OF FIGURES

SECTION 1
INTRODUCTION

1.1 OVERVIEW

This Operational Plan has been prepared to meet the requirements of Condition IV.E.(1) through (5) of the Administrative Consent Order between the State of Maryland Department of the Environment (MDE) and Black & Decker (U.S.) Inc. (April 1995) (Consent Order). Specifically, Conditions IV.E.(1) through (5) call for preparation of an Operational Plan containing a start-up report for the groundwater remediation system, a description of the procedures to be followed to monitor the groundwater treatment system, a health and safety plan, a groundwater monitoring plan, and a plan for maintenance of the carbon system installed on the Leister dairy well. This document is one of several which are being prepared in response to the Consent Order; each of these documents are to be submitted to the MDE in accordance with the schedule outlined in the Consent Order. Final versions of the documents are to become part of the Administrative Record for the site which is to be maintained at a public repository in the town of Hampstead.

1.2 OBJECTIVES

The primary objective of this Operational Plan is to provide the information required by Conditions IV.E.(1) through (5) of the Consent Order. With the exception of specific health and safety protocols and sampling and analysis methodologies (and associated QA/QC procedures), each of the elements of those conditions are addressed in this plan. Details regarding health and safety, sampling and analysis methods, and QA/QC are provided in a companion document, the Sampling and Analysis Plan (SAP). The SAP is prepared as a separate document because procedures described in that plan also apply to other activities and plans for the site (Supplemental Remedial Work Plan, etc.). In this manner, the SAP can serve as a single reference containing details related to field

sampling and laboratory methodologies and QA/QC procedures. The SAP will also be incorporated as part of the Administrative Record.

SECTION 2
STARTUP REPORT

2.1 OBJECTIVES

Groundwater recovery and treatment was selected as the most direct approach to aquifer remediation by preventing groundwater from migrating off-site. The system design included removing groundwater via a series of extraction wells (EW-1 through EW-10) located along the perimeter of the site, creating a cone of depression in the water table that would effectively alter groundwater flow such that the potential for off-site migration of contaminants would be eliminated.

The treatment system was designed according to the Conceptual Design Report for the Groundwater Remediation System (June 1992) and began operation in August 1994. Prior to operation, a trial startup phase of the treatment system was conducted in order to evaluate the performance and effectiveness of the system.

2.2 FIELD ACTIVITIES

During the trial startup phase of the treatment system, water levels and elapsed time data were collected using long-term monitoring data loggers (In-Situ Well Sentinel Model LTM3000) and transducers. These devices were installed at the east and west sides of the facility in monitor wells RFW-17 and PH-9, respectively. In addition, water level measurements were collected manually using hand-held electronic water level indicators from monitor wells specified in the Water Level Monitoring Plan of the Water Appropriation Permit.

The trial phase of the system started 6 June 1994 and continued until 23 June 1994. Water levels were collected consecutively for the initial ten hours and several times a day

for the next three days. Water levels were collected approximately every other day for the remainder of the trial phase. A list of water levels at selected elapsed time intervals is presented in Table 2-1.

Initially, the total pumping rate for the treatment system was 288 gpm. Pumping rates were adjusted, as necessary, to ensure hydraulic control across the site without excessive drawdown. Pumping rates for the extraction wells during the trial phase are summarized in Table 2-2.

2.3 CONCLUSIONS

The trial startup phase of the treatment system provided useful information concerning the effectiveness and performance of the system. As evidenced by the water level elevations (see Table 2-1), significant drawdown occurred in the majority of the on-site wells. In addition, little or no drawdown was observed in the off-site and distant upgradient (RFW-18 and RFW -19) wells. Figure 2-1 presents hydrographs of selected wells during the trial startup phase.

As evidenced by the hydrographs, water levels were continuing to decrease, after the extraction wells were pumping for approximately 400 hours, in RFW-11A and RFW-11B, located on the east side of the facility, and PH-7, located on the west side of the facility. In contrast, the hydrographs illustrate that little or no significant drawdown was observed in RFW-18, located upgradient of the site, and the AMOCO well, located off site.

Groundwater contour maps are presented on Figures 2-2 and 2-3. Figure 2-2 shows static groundwater conditions, prior to the start of the treatment system pumping. As evidenced by Figure 2-2, static groundwater flow is principally to the southwest, but also to the south and east. Figure 2-3 shows groundwater conditions at the end of the trial startup phase, while the extraction wells were pumping. Groundwater flow is still principally in the same direction. However, depressions in the potentiometric surface, due to the

Ta

Treatment System Trial Pha ter Level Measurements

Black & Decker

Hampstead, Maryland

WELL ID	TOC ELEV	PRE-PUMP		3 HRS		8 HRS		18 HRS		43 HRS	
		DTW	ELEV	DTW	ELEV	DTW	ELEV	DTW	ELEV	DTW	ELEV
EW-1(RFW-12B)	847.21	25.65	821.56								
EW-2(PH-3A)	849.21	27.56	821.65	34.53	814.68	35.46	813.75	34.77	814.44	38.35	810.86
EW-3(PH-1A)	846.64	25.82	820.82	34.73	811.91	34.73	811.91	36.46	810.18	38.77	807.87
EW-4(PH-4A)	858.01	35.15	822.86	36.21	821.80	37.37	820.64	39.32	818.69	41.41	816.60
EW-5(PH-2A)	864.17	36.80	827.37	42.80	821.37	43.03	821.14	46.03	818.14	44.76	819.41
EW-6(PH-13)	831.98	41.85	790.13	49.74	782.24	48.59	783.39	48.59	783.39	50.90	781.08
EW-7(RFW-5B)	818.38	15.83	802.55	24.88	793.50	25.45	792.93	25.45	792.93	25.80	792.58
EW-8(PH-10)	811.13	5.88	805.25	18.88	792.25	18.88	792.25	18.30	792.83	22.35	788.78
EW-9(PH-8)	811.35	8.63	802.72	25.64	785.71	27.95	783.40	32.58	778.77	38.35	773.00
EW-10(PW-7)	807.74	5.07	802.67							29.11	778.63
RFW-1A	864.37	31.54	832.83	31.48	832.89	31.41	832.96	31.53	832.84	31.71	832.66
RFW-1B	864.23	31.55	832.68	31.50	832.73	31.46	832.77	31.52	832.71	31.70	832.53
RFW-2A	857.41	13.99	843.42	13.93	843.48	13.82	843.59	13.90	843.51	13.86	843.55
RFW-2B	857.73	14.53	843.20	14.48	843.25	14.47	843.26	14.44	843.29	14.42	843.31
RFW-3B	839.21	21.75	817.46	21.75	817.46	22.08	817.13	22.07	817.14	22.14	817.07
RFW-4A	830.37	31.80	798.57	31.80	798.57	32.20	798.17	32.28	798.09	32.33	798.04
RFW-4B	830.37	31.90	798.47	31.90	798.47	31.62	798.75	32.29	798.08	32.35	798.02
RFW-5A	817.5	14.79	802.71	15.09	802.41	15.17	802.33	15.46	802.04	15.80	801.70
RFW-6	785.04	0.00	785.04	0.00	785.04	0.00	785.04	0.00	785.04	0.34	784.70
RFW-7	805.14	6.20	798.94	6.30	798.84	6.29	798.85	6.35	798.79	6.39	798.75
RFW-8	860.07	30.99	829.08	30.97	829.10	30.98	829.09	31.46	828.61	32.09	827.98
RFW-9	858.21	24.25	833.96	24.21	834.00	24.22	833.99	24.27	833.94	24.33	833.88
RFW-10	852.06	25.11	826.95	25.36	826.70	25.55	826.51	26.43	825.63	27.41	824.65
RFW-11A	849.32	27.87	821.45	28.10	821.22	28.37	820.95	29.71	819.61	31.22	818.10
RFW-11B	849.62	28.46	821.16	29.75	819.87	30.10	819.52	31.56	818.06	33.23	816.39
RFW-12B	844.87	23.34	821.53	23.41	821.46	23.81	821.06	24.72	820.15	26.04	818.83
RFW-13	849.11	47.75	801.36	47.75	801.36	47.76	801.35	48.27	800.84	48.27	800.84
RFW-14B	812.39	6.49	805.90	6.52	805.87	6.52	805.87	6.63	805.76	6.82	805.57
RFW-16	856.14	22.79	833.35	22.75	833.39	22.81	833.33	22.80	833.34	22.93	833.21
RFW-17	834.66	14.56	820.10								
RFW-18	843.67	2.45	841.22					2.46	841.21	2.50	841.17
RFW-19	858.28	5.17	853.11					5.20	853.08	5.22	853.06
PH-7	805.94	3.84	802.10	4.40	801.54	4.58	801.36	5.23	800.71	6.04	799.90
PH-9	814.94	11.96	802.98								
PH-11	820.68	30.55	790.13	30.95	789.73	31.48	789.20	32.00	788.68	32.45	788.23
PH-12	828.35	32.35	796.00	32.35	796.00	32.64	795.71	32.75	795.60	32.94	795.41
B-3	803.02	6.24	796.78					6.26	796.76	6.36	796.66
AMOCO	842.29	18.06	824.23	18.12	824.17	18.13	824.16	18.12	824.17	18.22	824.07
HAMP-22		0.69		0.70		0.71		0.70		0.68	

TOC = Top of casing (measuring point)

DTW = Depth to water (ft.)

B&D-1\OPTAB2-1.WK3

Table 2-1 (contin
Treatment System Trial Phase Water Measurements

Black & Decker
Hampstead, Maryland

WELL ID	TOC ELEV	93 HRS		190 HRS		404 HRS	
		DTW	ELEV	DTW	ELEV	DTW	ELEV
EW-1(RFW-12B)	847.21						
EW-2(PH-3A)	849.21	40.08	809.13	43.78	805.43	49.32	799.89
EW-3(PH-1A)	846.64	40.50	806.14	43.97	802.67	48.01	798.63
EW-4(PH-4A)	858.01	45.80	812.21	62.78	795.23	78.38	779.63
EW-5(PH-2A)	864.17	46.50	817.67	48.23	815.94	50.54	813.63
EW-6(PH-13)	831.98	52.06	779.92	52.06	779.92	50.32	781.66
EW-7(RFW-5B)	818.38	26.03	792.35	26.61	791.77	28.92	789.46
EW-8(PH-10)	811.13	24.08	787.05	25.81	785.32	29.86	781.27
EW-9(PH-8)	811.35	40.66	770.69	41.81	769.54	56.26	755.09
EW-10(PW-7)	807.74	30.17	777.57	31.13	776.61	33.20	774.54
RFW-1A	864.37	32.25	832.12	33.08	831.29	34.64	829.73
RFW-1B	864.23	32.20	832.03	33.07	831.16	34.65	829.58
RFW-2A	857.41	13.97	843.44	14.03	843.38	14.22	843.19
RFW-2B	857.73	14.52	843.21	14.63	843.10	14.80	842.93
RFW-3B	839.21	22.42	816.79	22.77	816.44	23.56	815.65
RFW-4A	830.37	32.57	797.80	32.87	797.50	33.22	797.15
RFW-4B	830.37	32.45	797.92	32.89	797.48	33.21	797.16
RFW-5A	817.5	16.45	801.05	17.24	800.26	19.30	798.20
RFW-6	785.04	0.62	784.42	0.88	784.16	0.80	784.24
RFW-7	805.14	6.55	798.59	6.70	798.44	6.52	798.62
RFW-8	860.07	33.13	826.94	34.49	825.58	36.46	823.61
RFW-9	858.21	24.67	833.54	25.09	833.12	25.98	832.23
RFW-10	852.06	28.83	823.23	30.60	821.46	32.87	819.19
RFW-11A	849.32	33.63	815.69	36.41	812.91	40.65	808.67
RFW-11B	849.62	35.52	814.10	38.34	811.28	42.60	807.02
RFW-12B	844.87	27.44	817.43	29.39	815.48	32.71	812.16
RFW-13	849.11	48.49	800.62	49.00	800.11	49.79	799.32
RFW-14B	812.39	7.41	804.98	8.76	803.63	12.56	799.83
RFW-16	856.14	23.41	832.73	24.19	831.95	25.68	830.46
RFW-17	834.66						
RFW-18	843.67	2.54	841.13	2.66	841.01	2.81	840.86
RFW-19	858.28	5.30	852.98	5.49	852.79	5.63	852.65
PH-7	805.94	7.17	798.77	8.44	797.50	10.93	795.01
PH-9	814.94	13.03	801.91	14.28	800.66	16.21	798.73
PH-11	820.68	32.97	787.71	33.53	787.15	33.78	786.90
PH-12	828.35	33.31	795.04	33.80	794.55	34.66	793.69
B-3	803.02	6.33	796.69	6.40	796.62	6.71	796.31
AMOCO	842.29	18.40	823.89	18.54	823.75	19.14	823.15
HAMP-22		0.68		0.68		0.67	

TOC = Top of casing (measuring point)
DTW = Depth to water (ft.)

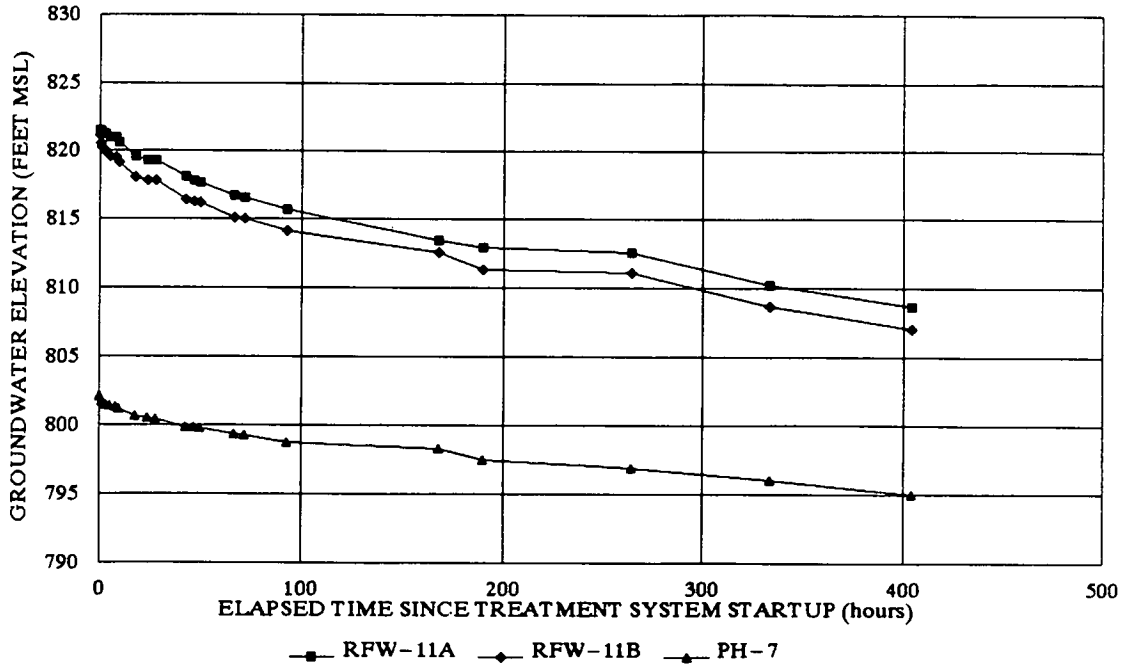
B&D-1\OPTAB2-1.WK3

Table 2–2
Extraction Well Pumping Rates

Black & Decker
Hampstead, Maryland

EXTRACTION WELL ID	TREATMENT SYSTEM TRIAL PHASE	
	Initial Pumping Rate (gpm) 6 June 1994	Final Pumping Rate (gpm) 23 June 1994
EW–1	30	23
EW–2	38	37
EW–3	51	50
EW–4	33	19
EW–5	31	30
EW–6	20	15
EW–7	16	24
EW–8	25	34
EW–9	19	22
EW–10	25	25
TOTAL	288	279

B&D–1\OPTAB2–2.WK3



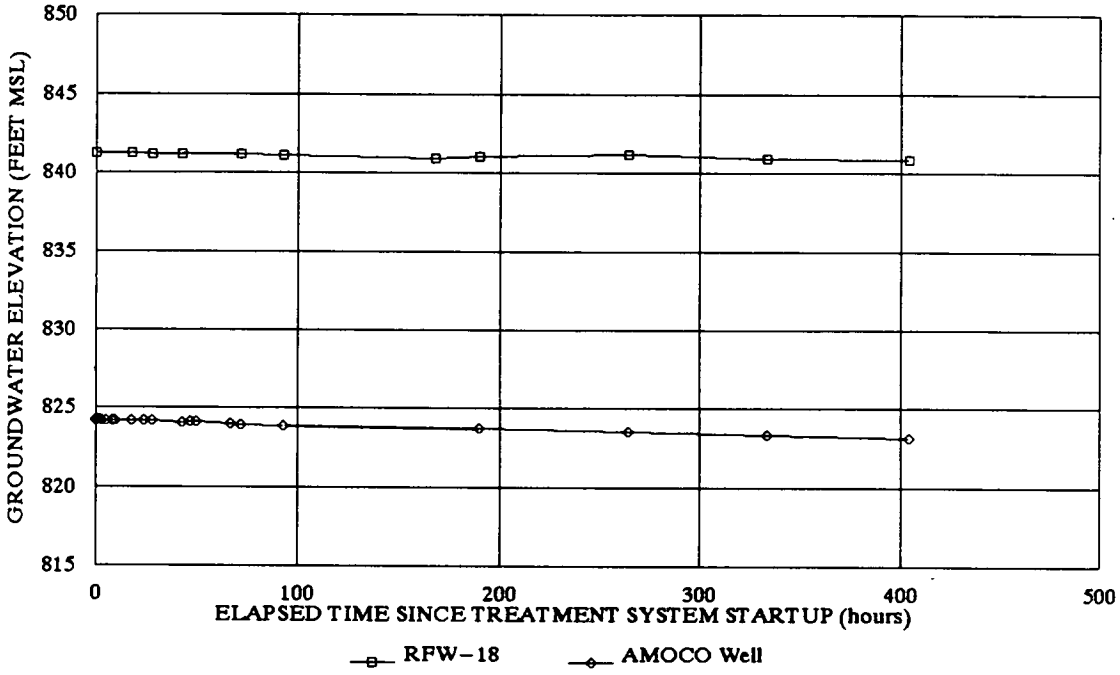


FIGURE 2-1
HYDROGRAPHS OF SELECTED WELLS DURING TREATMENT SYSTEM TRIAL PHASE
Operational Plan
Black & Decker
Hampstead, Maryland

95P-3055 6/13/95

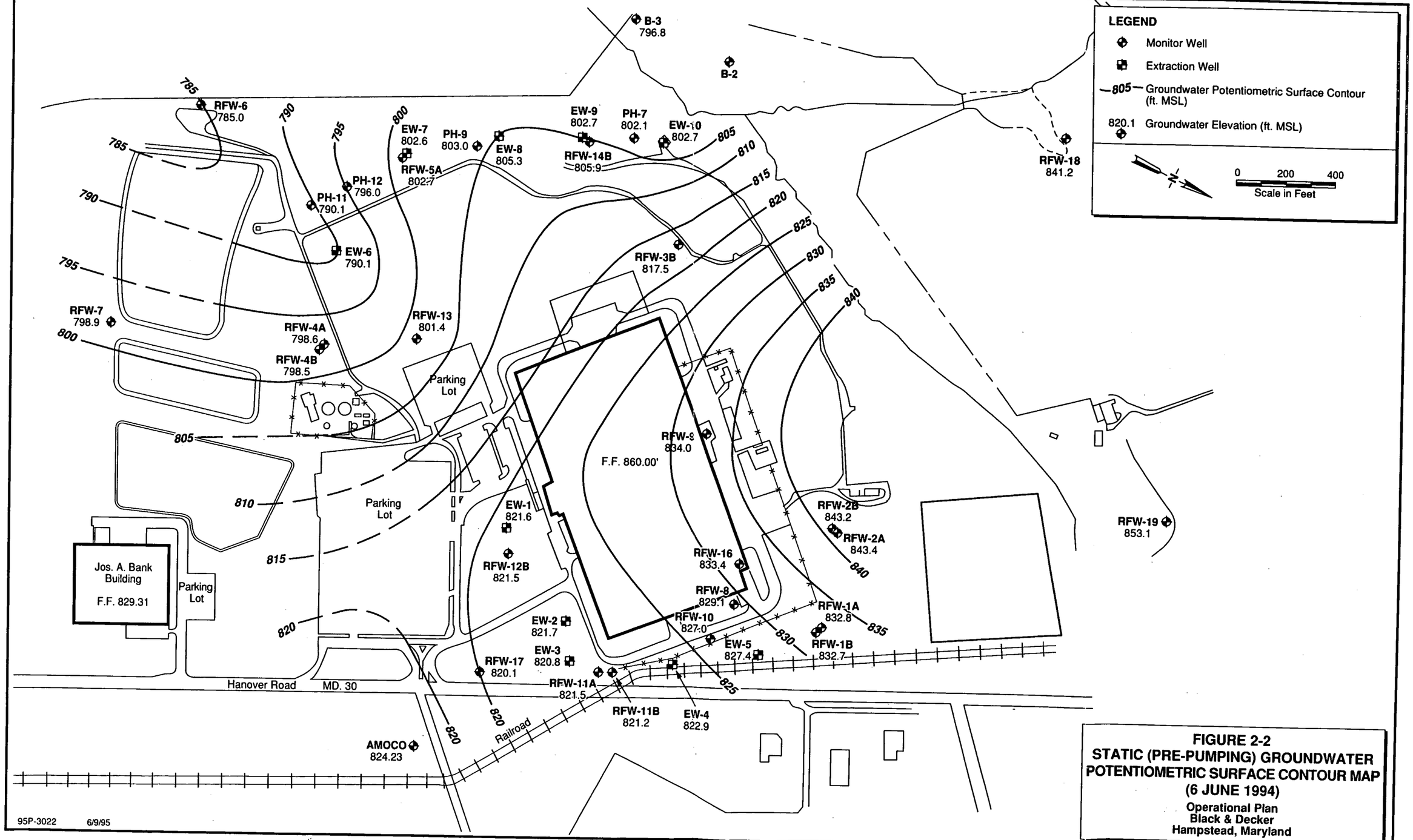


FIGURE 2-2
STATIC (PRE-PUMPING) GROUNDWATER POTENTIOMETRIC SURFACE CONTOUR MAP (6 JUNE 1994)
Operational Plan
Black & Decker
Hampstead, Maryland

95P-3022 6/9/95

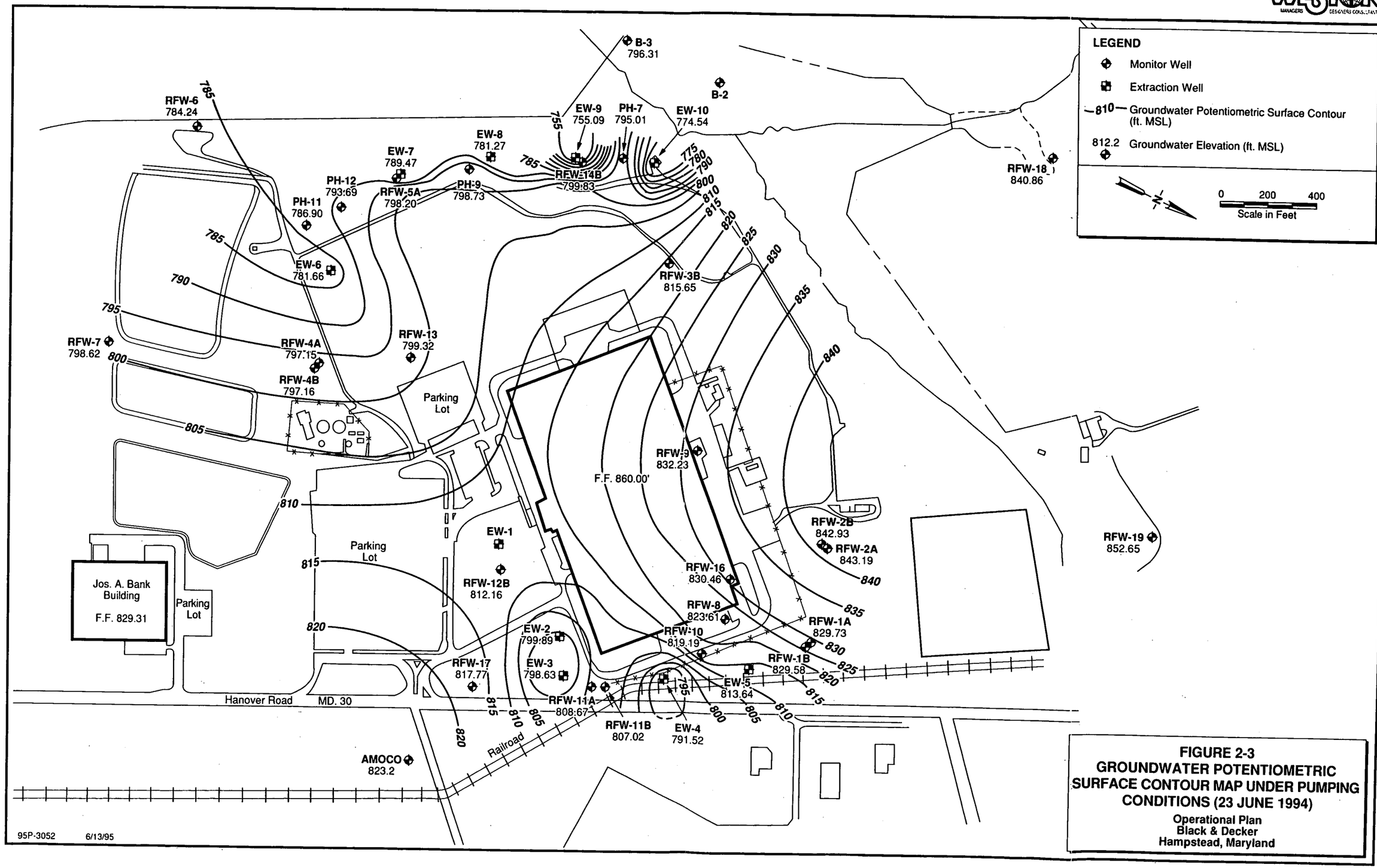


FIGURE 2-3
GROUNDWATER POTENTIOMETRIC SURFACE CONTOUR MAP UNDER PUMPING CONDITIONS (23 JUNE 1994)
Operational Plan
Black & Decker
Hampstead, Maryland

pumping of the extraction wells, are evident on the map. Flow lines indicate that the direction of groundwater flow is toward the extraction wells.

The trial startup phase of the treatment system indicated that the ten extraction wells created a hydraulic boundary preventing off-site migration of groundwater. In addition, the removal of groundwater from the extraction wells will not affect the ability of off-site domestic and public utility wells to obtain water for water supply purposes.

SECTION 3
OPERATION AND MONITORING PLAN

3.1 INTRODUCTION

3.1.1 Introduction/Background

This report documents the standard procedures for operating and monitoring the interim groundwater treatment system at the Black &Decker Hampstead, Maryland facility. The 150-acre facility has operated since 1952, originally manufacturing power hand tools. The current focus of plant activities is distribution rather than manufacturing.

The detection of chlorinated hydrocarbons in the groundwater at the site has led to the need for a groundwater remediation system. The interim groundwater remediation system consists of pumping groundwater from ten extraction wells and treating it to remove trichloroethylene (TCE) and perchloroethylene (PCE) using an air stripper. The objective of pumping and treating groundwater is to develop hydraulic barriers along the east and west sides of the Hampstead plant, which will minimize the potential for off-site migration of groundwater containing volatile organic compounds (VOCs) and lead to restoration of groundwater quality.

The interim groundwater treatment system includes groundwater extraction wells, an air stripper, and two activated carbon units to control emissions. Ancillary to the groundwater treatment system are the potable and industrial cooling water systems, which utilize the treated groundwater for potable water and cooling water supply. Figure 3-1 is a piping and instrumentation diagram for the groundwater treatment system that also includes the ancillary components that are integral to the system operation. Table 3-1 is an equipment list for the groundwater treatment system.

EW 1 2-PF-PL-2
EW 2 2-PF-PL-2
EW 3 2-PF-PL-2
EW 4 2-PF-PL-2
EW 5 2-PF-PL-2
EAST TRAIN
2-PF-PL-2
3-PF-PL-2
4-PF-PL-2
EW 10 2-PF-PL-2
EW 9 2-PF-PL-2
EW 8 2-PF-PL-2
EW 7 2-PF-PL-2
EW 6 2-PF-PL-2
WEST TRAIN
2-PF-PL-2
WELL HOUSE #7
BELOW GRADE
ABOVE GRADE
6-PF-PL-2
6-PF-PL-4
4-PF-PL-2
4-PF-PL-4
6x4 AND 4x3 REDUCING BUSHING
FR 100
FQI 100
FIT 100
FE 100
EXTRACTION WELLS EW 1 TO EW 10
AIR STRIPPER SYSTEM
DEMISTER
6-PF-PL-5
1/2" SAMPLING VALVE
MANWAY
MANWAY
MANWAY
FS 102A
FS 102B
AND
ME-2A
ME-2B
OR
LSH 101
10-LPA-PL-4
3-PF-PL-4
ME-1A LIMITED BY PASS
BELOW GRADE
ABOVE GRADE
2" DRAIN
AIR STRIPPER ME-1A
AIR STRIPPER BLOWERS ME-2A & ME-2B
1035 CFM @ 6" W.C.(MAX.)
DUCT HEATER H-1
CARBON ADSORBERS C-1A & C-1B
10-LPA-PL-4
VENT TO ATMOSPHERE
TS
H-1
C-1A
C-1B
ABOVE GRADE
BELOW GRADE
ABOVE GRADE
6-PF-PL-11
LIC 103
SS 103
LIT 103
6-PF-PL-4
1/2" SAMPLING VALVE
ECC.RED. F.O.T.
4x3 RED. BUSHING
6x4 RED. BUSHING
PI
P-11
P-12
4x3 RED. BUSHING
6x4 RED. BUSHING
STRIPPER SUMP PUMPS P-11 & P-12
TYPE: CENTRIFUGAL
FLOWRATE: 295 GPM
DRIVER: EM-50 HP
HEAD: 234'
1-SC-PL-5
4-DW-PL-4
XV 104A
XV 104B
M
LEAD
LAG
FC
BELOW GRADE
PIC 108
PIT 108
PCV 108
6-PF-PL-4
6-PF-PL-5
PRODUCT DISTRIBUTION BUILDING
EXISTING 4" INDUSTRIAL COOLING WATER SUPPLY LOOP
BRANCH 6x4 SADDLE
8-DN-CI-2
TO
8"-PW TO PRODUCT DISTRIBUTION BUILDING
8"-PW
12-PW (TRANSITE)
8-PW (C.I.)
STRAINER
BELOW GRADE
ABOVE GRADE
PI
8"
P-13
2"
EXISTING LAKE PUMP HOUSE
NEW VERTICAL TURBINE PUMP P-13
FLOWRATE: 300 GPM
DRIVER: EM-30HP
HEAD: 278'
10-PW (TRANSITE)
LAKE INTAKE
EXIST. 12" THERMAL RETURN LINE TO RESERVOIR (GRAVITY)
HYDROPNEUMATIC PACKAGED SYSTEM
PSV
AIR VENT
S
FILTER 1/2-PA-CS-4
LSH
PS LEAD
PS LAG
LSL
LCS
LAL
PCS
AIR
WATER
PI
SIGHT GLASS
MANWAY
EXISTING PLANT AIR SUPPLY
LAL 110
REMOTE LOW LEVEL
DRAIN
HYDROPNEUMATIC STORAGE TANK T-2
CAPACITY: 2000 GAL.
MAT'L: STEEL
4-DW-PL-5
LAH
LCS 104
LAS 106
LSL 105
CT3/4
CT2
CT1
OR
LE
LEAD/LAG/SPARE PUMP CONTROL
A
1 1/2"
3"
P-17
P-18
P-19
4-DW
TO PLANT DOMESTIC WATER SYSTEM (POTABLE)
EXISTING WET WELL
EXISTING WET WELL PUMPS 50 GPM
EXISTING MIXER
REMOVE ANTI-SIPHON FITTING AND PLUG OUTLET
1/2" SAMPLE VALVE (EXISTING)
N.C.
NEW BLOCK VALVE
SS 104
1/2-SH (PVC)
EXISTING SODIUM HYPOCHLORITE TANK 165 GALLONS
EXISTING METERING PUMP P-15
EXISTING METERING PUMP P-16
EXISTING SODIUM HYPOCHLORITE TANK 100 GALLONS
(MIXER RELOCATED FROM EXISTING SODIUM HYPOCHLORITE TANK) M-1
M-1
P-14
MANUAL ADDITION OF SODA ASH AND WATER
SODA ASH TANK T-1
CAPACITY: 360 GAL.
MAT'L: HDPE
T-1
METERING PUMP W/B.P. VALVE P-14
TYPE: PISTON
FLOW: 0-3 GPH
HEAD: 234'
DRIVER: EM-1/8 HP
TO ATMOSPHERE
3"
ABOVE GRADE
BELOW GRADE
3-PF-PL-4
N.C.
1/2" ABOVE GRADE SAMPLING VALVE
6-DW
EXISTING AIR STRIPPER BLOWERS
EXISTING AIR STRIPPER 150 GPM
QI
HS
HOA
QS
LOR
HS
PI
LSL 001
PI
TI/10
FCV
TI/10
QY 101
QA 101
TO EACH WELL
V-100
ABOVE GRADE
BELOW GRADE
2-PF-PL-5
1/2" SAMPLING VALVE
2-PF-PL-2
1/4" TUBING (SEE DWG. 405 FOR TUBING LENGTH)
WELL PUMPS P-1 TO P-10
TYPICAL EXTRACTION WELL P&I DIAGRAM

WELL	PUMP	DESIGN FLOW (GPM)	NORMAL FLOW (GPM)	▲
EW 1 •	P-1	35	35	001
EW 2	P-2	55	40	002
EW 3	P-3	90	50	003
EW 4	P-4	30	30	004
EW 5	P-5	75	30	005
EW 6	P-6	45	20	006
EW 7	P-7	70	20	007
EW 8	P-8	80	25	008
EW 9	P-9	33	20	009
EW 10	P-10	40	25	010
TOTALS		553	295	

• LOW WATER LEVEL PUMP SHUTOFF REQUIRED FOR EXTRACTION WELL EW-1 ONLY

RECORD DRAWING

NOTES: 1.) ALL INSTRUMENTATION IS NEW EXCEPT AS NOTED.
2.) ——— EXISTING PIPING
3.) ——— NEW PIPING

FIGURE 3-1

NO	DATE	APPD	REVISIONS
1	10/94	CWB	RECORD DRAWING
0	7/94	CWB	ISSUED FOR BIDDING

PLOTTED 11/08/94 9:
PLT SC.
FILE NO. 2501101

BLACK & DECKER, INC.
HAMPSTEAD MARYLAND
WESTON MANAGERS OF ECONOMICALLY SOUND SOLUTIONS

		DATE
CHECKED	JJK	
DES ENG	FM/HFE	
PROJ ENG	CWB	
PROJ MGR	RLM	
APPROVED	WHB	
APPROVED		

CLIENT APPROVAL DATE

WILLIAM H. BROWN, P.E.
MD. NO. 18451

3-2

GROUNDWATER REMEDIATION SYSTEM PIPING AND INSTRUMENTATION DIAGRAM

DRAWN	DATE	DWG NO.	REV. NO.
M.HANSEN	4/14/92	101	1
SCALE NONE	W.O. NO. 2501-04-01	Sht. ___ OF ___	

TABLE 3-1

MAJOR EQUIPMENT LIST
AIR STRIPPER GROUNDWATER TREATMENT SYSTEM

1. Well Pumps (P-1 through P-10)

Purpose:	To depress the water table sufficiently to capture and recover site-related contaminants of concern.
Number:	Ten, one at each extraction well
Type:	Submersible
Materials:	Stainless Steel
Capacities:	Static head, and rating as required.

Normal Flow Capacities:

P-1	35 gpm
P-2	40 gpm
P-3	50 gpm
P-4	30 gpm
P-5	30 gpm
P-6	20 gpm
P-7	20 gpm
P-8	25 gpm
P-9	20 gpm
P-10	25 gpm

2. Flow Control Valves (FCV-001 to FCV-010)

Purpose:	To control flow from each well pump at the predetermined well drawdown rate.
Number:	Ten, one per well pump
Description:	Hydraulically operated valve
Material:	Cast Iron
Additional:	Maximum capacity to match maximum well flows. Initial orifice sized for normal flows.

3. Flow Water Meters (FE/FQ-001 to FE/FQ-010)

Purpose:	To provide rate indication and flow totalizing for each well
Number:	Ten, one per well pump
Description:	Standard bronze turbine water meters with pulser and rate indicator/totalizer
Capacity:	As required for each well, at the predetermined pump drawdown rate
Materials:	Standard bronze construction

TABLE 3-1

MAJOR EQUIPMENT LIST
AIR STRIPPER GROUNDWATER TREATMENT SYSTEM
(continued)

4. Well Box

Purpose:	To house flow control valve, flow meter and pump control panel at each well.
Number:	Ten, one per extraction well
Size:	5'-0" x 5'-0 x 4'-0" high
Material:	Fiberglass

5. Stripper Inlet Flow Recorder/Totalizer (FQI-100)

Purpose:	To provide rate indication and flow totalizing for water entering the air stripper.
Number:	One
Description:	Panel mounted flow rate recorder/totalizer.
Capacity:	As required to cover range 185 to 600 gpm

6. Potable Water Supply. Flow Indicator/Totalizer

Purpose:	To provide rate indication and flow totalizing for water entering the potable water system.
Number:	One
Description:	Panel mounted flow rate recorder/totalizer

7. Air Stripping Tower (ME-1A)

Purpose:	To remove volatile organics from groundwater.
Number:	One
Capacity:	553 gpm at design VOC concentrations
Type:	Counter-current, groundwater downflow. 5-foot diameter column with 42-feet packing depth of 2-inch diameter polypropylene packing (No. 1 Jaeger Tri-Packs) and 52-feet high.
Materials:	FRP column with polypropylene packing
Additional:	Weir or orifice top distributor, mist eliminator, orifice/riser type redistributor, packing section loading/unloading manways and minimum 4-foot sump liquid capacity.

TABLE 3-1

MAJOR EQUIPMENT LIST
AIR STRIPPER GROUNDWATER TREATMENT SYSTEM
(continued)

8. Air Stripping Blowers (ME-2A, ME-2B)

Purpose:	To provide requisite air flow for the stripper.
Number:	Two; one operating, one standby
Capacity:	1,185 cubic feet per minute (cfm) at 6-inches of static pressure maximum.
Type:	Centrifugal fan
Material:	Aluminum
Additional:	Low air flow switch in fan discharge to shut down feed upon blower failure.

9. Stripper Sump Pumps (P-11, P-12)

Purpose:	To transfer treated groundwater from the air stripper to cooling water loop and potable water supply.
Number:	Two, one operating, one standby.
Capacity:	295 gpm @ required TDH
Type:	Centrifugal, with variable speed motor.
Material:	Standard construction, bronze fitted.
Additional:	Speed adjusted by level controller. Shutoff on low level.

10. Electric Duct Heater (H-1)

Purpose:	Boost air temperature an average of 30°F prior to GAC
Number:	One
Capacity:	12 KW maximum for 40°F rise.
Type:	In duct electrical resistance heater.
Additional:	Integral thermostat to control temperature with a minimum 75 to 90°F set point range.

11. Vapor Phase Granulated Activated Carbon (GAC) Units (C-1A, C-1B)

Purpose:	To remove volatile organics from air stripper off-gases.
Number:	Two
Capacity:	Minimum 300 lb GAC
Material:	Polyethylene or coated steel vessel

The major components of the groundwater treatment system include:

- Ten well pumps (EW-01 to EW-10), wellhead valves, controls, and buried piping to pump groundwater from the wells through the air stripper.
- An air stripper (ME-1A), sized to treat up to 553 gpm.
- Duct heater (H-1) to reduce the humidity of the exhaust air prior to emission control.
- Two vapor phase carbon adsorbers (C-1A, C-1B) for emission control.
- Two stripper sump pumps (P-11, P-12).

Ancillary components of the potable water system include:

- An existing 4,000-gallon wet well, with three wet well pumps (P-17, P-18, and P-19), and associated controls.
- A 2,000-gallon hydropneumatic storage tank (T-2), with associated controls.
- Sodium hypochlorite, and soda ash metering into the wet well.

Ancillary components of the industrial cooling water system include:

- Pressure control valve (PCV-108), and associated piping.
- Cooling water reservoir (lake) pumphouse, and associated pumps and controls.

3.1.2 Process Overview

Groundwater is continuously pumped from the groundwater wells (EW-1 to EW-10) through the air stripper (ME-1A), where it enters through the distributer at the top of the

stripper, and flows down through the high surface area packing. As the water passes through the stripper packing, it contacts air flowing countercurrent to the water. Air is supplied by one of two blowers (ME-2A, ME-2B). The stripped water collects in the air stripper sump, and is pumped to both the industrial cooling water supply loop and potable water supply system. Any excess water during low demand periods is routed to the cooling water lake. Flow and pressure controls split the stripped water in the appropriate proportions to these use destinations.

3.1.3 Organization

This is organized as follows:

- Section 3.2 includes the standard operating and maintenance procedures completed by the operator for each component of the groundwater treatment system.
- Section 3.3 includes the standard monitoring procedures for the system.

3.2 OPERATING PROCEDURES

The following operating procedures will be used for groundwater extraction wells and groundwater treatment for VOC removal. The equipment described in the following text, as well as the letter and number designations for that equipment, is illustrated in Figure 3-1, which is the piping and instrumentation diagram for the groundwater treatment and ancillary potable water supply and industrial cooling water systems.

3.2.1 Groundwater Extraction Wells

3.2.1.1 Equipment Description

As previously indicated in Section 3.1, there are 10 groundwater extraction wells, EW-1 to EW-10. These wells provide sufficient hydraulic control at a total groundwater pumping rate of about 160 gallons per minute (gpm). The wells are connected to a common header which leads to the influent to the air stripper. Each well includes the following ancillary equipment:

- An analog turbine meter with a simple mechanical flow reading and totalizer.
- A self contained flow control valve that can be used easily for minor flow adjustments and can be easily modified to change flow range by changing the flow measurement orifice.
- A well water sampling valve.
- Water level measurement system consisting of a PVC riser pipe, plastic tubing, and a pressure gauge.
- A temperature switch and alarm. The alarm signals at the main control panel.
- A water alarm switch that alarms when water is detected on the floor of the well house. The alarm signals at the main control panel.

3.2.1.2 Operating Procedures

All ten extraction wells will be normally operated 24-hours per day, year-round except for maintenance. Flows are maintained for each well by the flow control valve orifice. Flows were selected based upon performance testing conducted during the startup phase.

The well pumps are started and shut down either locally or from the groundwater treatment system control panel, at the air stripper. To start a well pump:

- Verify that the treatment system is on-line.
- Verify that the block valve at the well head is opened.
- Start pump using hand switch (local or panel).
- Verify normal flow and operation.

To stop a well pump, simply operate the hand switch. If the pump will be shut down for maintenance or an extended time, also close the block valve at the well head.

The wells are checked on a weekly basis during the plant's day shift. Weekly checks consist of the following:

- Visually check equipment when it is in operation. This visual check will consist of:
  - Checking for leaks in equipment.
  - Check that heating system is functioning properly.
  - Check for unusual vibration in the pump that may indicate a potential well pump problem.
- Record flow totalizer and flow rate readings, on the Well Log Sheets. Note any abnormalities.
- Report any leaks or abnormal conditions to the Maintenance Department for subsequent inspection and repair.

A trouble shooting guide for the well pumps may be found in the Section 7 of the Goulds Pumps, Inc. Installation, Operation, and Maintenance Instructions.

3.2.2 Air Stripper

3.2.2.1 Mechanical Equipment Description

The groundwater pumped from the wells is treated in an air stripper (ME-1A), a vertical tower containing randomly placed polypropylene packing media that provides high surface area for mass transfer. The water flows down countercurrent to an ascending air stream. The air strips the volatile organic compounds from the descending water and then exits the top of the stripper. Before exiting the tower, a mist eliminator consisting of randomly placed small packing media, separates any entrained water from the air stream containing the volatile organic compounds. The treated water percolates down to the bottom of the tower which serves as the stripper sump.

Water distribution at the water inlet near the top of the tower is accomplished by means of a distributor tray that ensures proper water distribution to the entire cross section of the packing. A redistributor at the packing midpoint, 21 feet below the top of the tower, regathers and uniformly redistributes the water to ensure good contact with the rising air stream throughout the tower.

The stripper is equipped with a duct air heater (H-1) located in the ductwork run between the air stripper and the GAC system. Its purpose is to reduce the relative humidity of the air to approximately 50 percent of its saturation value by raising the air temperature by 25°F. Unless heated, air exiting the stripper typically would be at the temperature of the influent groundwater (about 55°F). The heater is provided with a thermostat to maintain the temperature within a range of 70°F to 90°F and should generally be set at 80°F.

The air stripper is equipped with two centrifugal blowers each dampened at the fan outlet for shut-off and/or throttling of air flow. Each of the two blowers (ME-2A, ME-2B) is sized for normal operating conditions of 1,200 acfm at 14 inches of water column (or less) and 70°F. Each blower is sized to supply the required air. The second blower is

an installed spare to operate if one is damaged. Isolation of blowers is accomplished with a manually operated damper.

The system is interlocked so that when the blower is shut down, the entire system shuts down automatically, including the extraction well pumps.

The system is equipped with two temporary vapor phase activated carbon canisters (C-1A, C-1B) operating in series with each other to treat volatile organic compounds in the air stripper exhaust. Each carbon canister contains 300 lbs. of activated carbon and the canisters are each rated for 1,500 acfm.

Treated water that collects in the stripper sump is pumped in appropriate proportions to the potable water supply, the industrial cooling water supply loop, or the facility lake, depending on the demand at the various use points. The potable water supply demand is based on respective levels in the water supply wet well, and the hydropneumatic storage tank (T-2). The water demand in the cooling water loop is based on the pressure detected in the cooling water loop (PIT/PIC-108) which controls a pressure control valve (PCV-108). When cooling water demand is low, pressure rises and the valve opens diverting water from the stripper sump pump effluent from the cooling water loop to the facility lake.

3.2.2.2 Key Instrumentation Description

The instrumentation for the groundwater treatment system consists of the following:

- A flow meter (FE-100), transmitter (FIT-100), totalizer (FQI-100), and recorder (FR-100), which automatically monitors total flow from the well system to the stripper.

- Level sensors and lever indicating transmitter (LIT-103) at the air stripper sump. The level in the stripper sump signals to the variable frequency drives and controls the speed of the stripper sump pumps.

- Variable frequency drives (VFD) for the stripper sump pumps, and speed switches (SS-103).

- Solenoid valves (XV-104A, XV-104B) which control the diversion of flow from the discharge of the stripper sump pumps to the potable water wet well for treatment with sodium hypochlorite and soda ash and pumping to the potable water distribution system via the hydropneumatic storage tank (T-2).

- Pressure control valve (PCV-108), pressure indicating transmitter (PIT-108) and pressure indicating controller (PIC-108), that controls the diversion of excess treated water from the industrial cooling water system to the cooling water lake.

3.2.2.3 Operating Procedures - Normal Operation

Daily Equipment Checks

During normal operation the system will operate automatically with a minimum of operator attention. Equipment checks will be performed on a daily basis. These equipment checks will include the following:

1. Check oil levels in the stripper sump pumps.

2. Check pumps for vibration, excessive heat, and noise.

3. Check instrumentation readings and record on the Daily Log Sheet. Check readings against the set points, and note any discrepancies that may indicate a malfunction in the system.

4. Check blower operation, for air flow, excessive heat and vibration and noise.

5. Check to see that the air heater is functioning.

6. In winter, drain condensate from exhaust air piping.

7. Check for leaks in the control room, and throughout the piping system.

8. Calibrate the Organic Vapor Analyzer (OVA) in accordance with manufacturer's instructions and monitor air quality upstream of the primary carbon canister, between primary and secondary canister, and at the exhaust duct of the secondary canister. (See Section 3.3)

Weekly Operator Activities

The following are required to be performed weekly:

1. Rotate the lead and lag stripper sump pumps to equalize the hours of operation for each pump.

2. Rotate the operating blower so that each blower operates an equal amount of time.

Quarterly Operator Activities

The following will be performed quarterly:

1. Check the flow rate readings from each of the 10 wells (EW-1 to EW-10) against the flow reading recorded at the control panel (FR-100). Recalibrate flow meters if required.

2. Turn the blower off and check the proper operation of interlocks that should shut down the well pumps, and the duct heater. Repair as required.

3. Shut the stripper pumps down, letting the level build up in the stripper sump, and check the proper operation of interlocks that should shut down the well pumps, blower, and duct heater. Repair as required.

4. Check the calibration of the stripper sump pumps' VFD by checking the shaft rotation in revolutions per minute using a strobe light versus the controller output. Detailed instructions for calibration of the VFDs may be found in the manufacturer's literature. Recalibrate as necessary.

5. Check pressure drop across the stripper tower by using the individual pressure taps provided at specific points in the system. Pressure drop should be equal to or less than the following:

-	Across lower packed bed:	Approximately 1 inch of water column
-	At tap above mist eliminator:	Approximately 2 inches of water column.

If the pressure drop is too high, the following problems should be investigated:

1. Packing is partially blocked.
2. Column may be blocked with solids.
3. The bottom drain or effluent piping could be blocked.
4. The demister or distributor could be partially blocked with solids.
5. Algae could be growing at the packing in the areas of the observation windows.

A stripping column can be cleaned by chemical washing with such chemicals as chlorine or a combination of chlorine and ozone. Consult the tower vendor for further details on the appropriate cleaning process. Algae growth may be prevented by installing an opaque cover on the observation windows that pivots away from the window during inspections of the tower internals.

As-Needed Operator Activities

When the OVA reading from the lead activated carbon canister reaches 15% of the inlet reading (when considering the ambient background reading), replace the carbon in the lead canister with fresh carbon and switch the secondary canister into the primary position. Ship spent carbon off site for appropriate disposal or regeneration. This

procedure will be in effect until Black & Decker demonstrates that GAC emission control is not necessary, in accordance with provisions of the air emission permit.

Yearly Operator Activities

The following should be performed yearly:

1. Calibrate PIT, PIC, and PCV-108.
2. Calibrate LIT-101, and LSH-103.
3. Test that valves XV-104A and XV-104B, close tight by removing their respective fuses and checking their integrity by visual observation.

3.2.2.4 Start Up Procedures

Start up of the system is performed as follows:

1. Verify that all well pumps are properly prepared for pumping and switched on.
2. Verify that all block valves in the normal flow paths are in the open position.
3. Turn the blower to the "on" position.
4. The air heater will cycle on automatically. Verify operation by checking temperature at outlet of heater.
5. Well pumps will cycle on automatically, each about five minutes apart. Verify by periodically checking flow at the flow recorder (FR-100).
6. As the level in the stripping tower sump increases, the stripper sump pumps will cycle on slowly based on the level in the stripper sump. Check sump level and pump operation to verify proper operation.

3.2.2.5 Shut Down Procedures

System shut down should only occur under an emergency condition, since the system is the primary source of potable water for the facility. System shut down is as follows:

1. Manually shut down well pumps using panel or local hand switches.
2. Turn off / silence alarms.
3. Verify that the stripper sump pump shuts itself down based on the decreasing level in the stripper sump.
4. Verify water pressure decrease in PIT-108.
5. When the stripper sump pumps are all off, shut the blower down.
6. Report all unplanned system shutdowns immediately to Vince DeGrava or LaVere Grimes. They will make appropriate notifications to the MDE.

SECTION 4
MONITORING PLAN

4.1 GROUNDWATER QUALITY MONITORING

Pursuant to the Consent Order, groundwater sampling will be conducted on a quarterly basis for an additional four years, at which time the frequency of sampling and the quantity of wells to be sampled will be reevaluated. The quarterly sampling will continue during the months of February, May, August, and November. Samples will be analyzed for Volatile Organic Compounds (VOCs) by EPA Method 8260. Monitor wells to be sampled are presented in Table 4-1. Sampling procedures, including QA/QC methodologies, are outlined in the Black & Decker, Hampstead facility Sampling and Analysis Plan (WESTON, 1995).

4.2 WATER LEVEL MONITORING

Water levels of monitor wells included in the Water Level Monitoring Plan of Groundwater Appropriation Permit are to continue to be measured on a monthly basis. A complete list of those wells is presented in Table 4-2.

4.3 INDICATOR WELL SELECTION

Pursuant to the Consent Order, wells EW-3, EW-4, and EW-5 on the east side of the facility and EW-6, EW-7, and EW-8 on the west side of the facility were selected as "indicator wells". Indicator wells are to serve as points of compliance for determining whether aquifer remediation goals have been met.

Table 4–1
Black and Decker
Quarterly Groundwater Sampling Locations

WELL ID NO.
EW–1
EW–2
EW–3
EW–4
EW–5
EW–6
EW–7
EW–8
EW–9
EW–10
RFW–1A
RFW–1B
RFW–2A
RFW–2B
RFW–3B
RFW–4A
RFW–4B
RFW–5A
RFW–6
RFW–7
RFW–8
RFW–9
RFW–10
RFW–11A
RFW–11B
RFW–12B
RFW–13
RFW–16
RFW–17
RFW–18
RFW–19
TOWN #22
TOWN #23
LEISTER DAIRY WELL
LEISTER RES. WELL #1
LEISTER RES. WELL #2
LEISTER RES. WELL #3
JOS. A BANK PROD. WELL #1
JOS. A BANK PROD. WELL #2
"SHOPPING CENTER" WELL*

* proposed location

Table 4-2
Black and Decker
Groundwater Level Monitoring

WELL ID NO.
EW-1
EW-2
EW-3
EW-4
EW-5
EW-6
EW-7
EW-8
EW-9
EW-10
RFW-1A
RFW-1B
RFW-2A
RFW-2B
RFW-3B
RFW-4A
RFW-4B
RFW-5A
RFW-6
RFW-7
RFW-8
RFW-9
RFW-10
RFW-11A
RFW-11B
RFW-12B
RFW-13
RFW-14B
RFW-16
RFW-17
RFW-18
RFW-19
PH-7
PH-9
PH-11
PH-12
B-2
B-3
AMOCO Well
Town : #22
Town : Century St.
Town : Houcksville Rd.
Town : Lower Beckleysville Rd.
Pembroke #1
Pembroke #2

4.4 AIR SAMPLING

Influent and effluent air samples will be collected and recorded on a daily basis during system operation. A portable VOC detector (OVA) will be used to measure VOC concentrations. Calibration of the OVA in accordance with manufacturer's procedures and air sampling results will be recorded daily in a logbook. In addition, at least one spare activated carbon canister must be on site to be used as a replacement canister if breakthrough occurs.

Emission controls may be removed from service after Black & Decker documents the following to the Maryland Department of the Environment:

- Both VOC and benzene emissions are decreasing over time, and
- The maximum emissions of VOCs are less than 20 pounds per day and of benzene are less than 0.02 pounds per hour.

4.5 SURFACE WATER DISCHARGE SAMPLING

Surface water discharge will be sampled on a monthly basis from Outfall 001 and Monitoring Point 201 and on a weekly basis from Monitoring Point 101. The following analytical parameters will be collected:

Outfall 001 - BOD5, Total Suspended Solids, Oil and Grease, and Total Residual Chlorine

Monitoring Point 101 - Fecal Coliform

Monitoring Point 201 - VOCs (TCE, PCE, and 1,1,1-TCA)

SECTION 5
LEISTER DAIRY FARM TREATMENT SYSTEM
MAINTENANCE PLAN

5.1 INTRODUCTION

In 1987, a groundwater treatment system was installed by Black & Decker (U.S.) Inc. at the Leister Dairy Farm on a well servicing a dairy barn. The well was found to contain trace levels of PCE.

The treatment system has been maintained since its installation by the equipment supplier retained by Black & Decker for that purpose. The maintenance conducted by the supplier is consistent with the equipment supplier's recommendations. The schedule was initially established based on routine monitoring of the water concentrations before treatment, at an intermediate point within the treatment system and after treatment.

This Maintenance Plan for the Leister Dairy Farm Groundwater Treatment System provides documentation required under Condition IV.E.(5) of the Administrative Consent Order between the State of Maryland Department of the Environment and Black and Decker (U.S.) Inc. (April, 1995).

5.2 DESCRIPTION OF THE TREATMENT SYSTEM

The Leister Dairy Farm Groundwater Treatment System consists of two stage granular activated carbon adsorption. It receives groundwater pumped from a bedrock groundwater well owned and maintained by the farm. The activated carbon treatment system consists of a total of four 14 inch by 48 inch fiberglass activated carbon tanks. Two of the units, in parallel to each other, operate as the "primary" treatment stage. The other two units ("secondary treatment" stage) are also in parallel to each other and are piped in series with the primary treatment units. The farm well provides sufficient water pressure to

maintain flow through the carbon beds. Therefore, there are no moving mechanical components in the treatment system. A sketch of the system is included as Figure 5-1.

5.3 MAINTENANCE PLAN

The treatment system is relatively simple and very effective, and therefore, the maintenance requirements are straight forward. Maintenance of these units consists of the following basic functions:

- Change outs of the carbon canisters on a regular basis,
- Inspecting all system components for proper operation and signs of corrosion, and
- Checking the system for leaks.

These activities are conducted by a contractor to Black & Decker (Culligan Funk) on a scheduled basis, once every 6 months, unless problems with the system are observed. The Contractor also addresses any problems which may be observed by the farm, on an as-needed basis.

5.4 MAINTENANCE PROCEDURES

The carbon change out, leak checks and system inspection consists of the following activities:

- Shut down well pump.
- Close treatment system inlet valve.
- Close treatment system outlet valve.

(FIBERGLASS VESSELS: 14" D x 48" H)

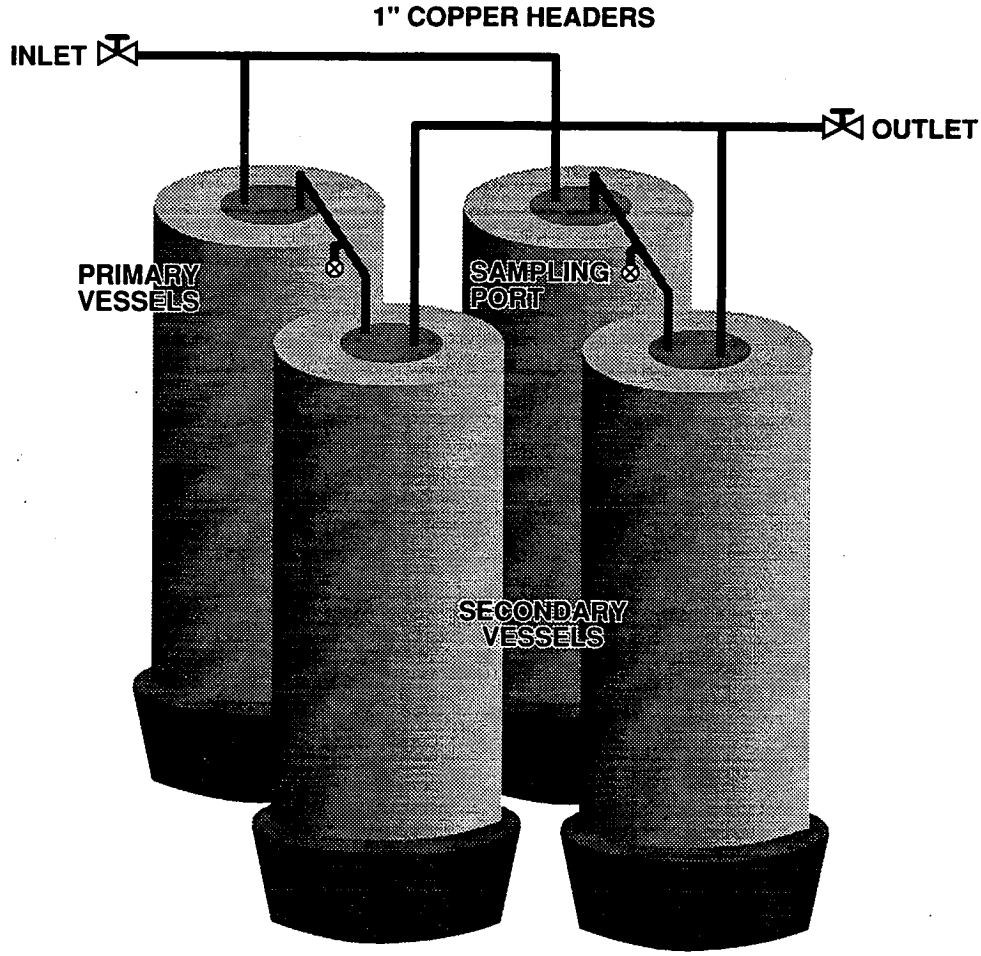


FIGURE 5-1
GRANULAR ACTIVATED CARBON TREATMENT SYSTEM
LEISTER DAIRY FARM
Operational Plan
Black & Decker
Hampstead, Maryland

95P-2978 6/13/95

- Bleed the pressure from the treatment system until the system is completely de-pressurized as indicated on the system pressure gauge.
- Visually inspect all valves and fittings for excessive wear or signs of corrosion; and replace if necessary.
- Remove the two primary treatment units and place them aside.
- Move the two secondary treatment units to the primary position, and connect and tighten all fittings.
- Place the new activated carbon treatment units in the secondary position, and connect and tighten all fittings.
- Re-pressurize the system. Start up the well pump.
- Check for leaks.
- Load the used primary canisters in the truck for shipment to Culligan Funk for regeneration by the carbon supplier.
- Check the system again for leaks when it is in operation before leaving the site.

5.5 DOCUMENTATION

Black & Decker will obtain appropriate documentation from the contractor indicating that all routine and non-routine maintenance has been performed. Routine maintenance reports will verify the replacement of the primary carbon beds and completion of the inspection and leak checks. Non-routine maintenance reports will document the nature of the problem, what was done to correct it and list any parts replaced. All reports will include the date and Contractor name and signature.