# OPERATIONAL PLAN

**Prepared for:**

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

**JUNE 1995**

**Prepared by:**

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

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# 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.)

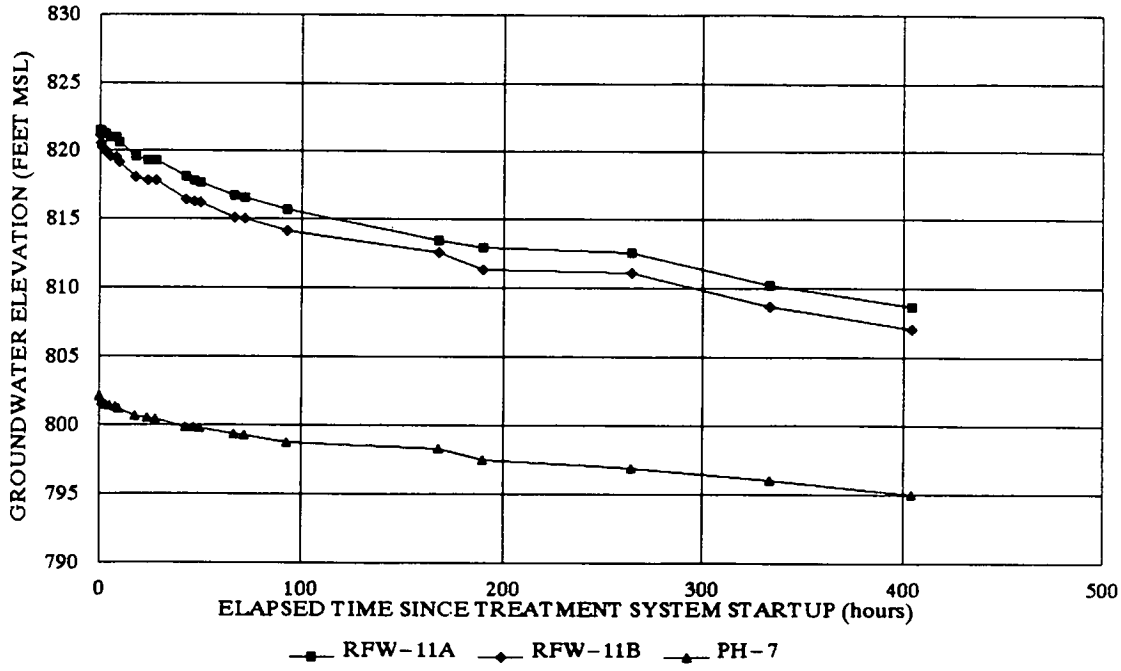
B&D-1\OPTAB2-1.WK3

## 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



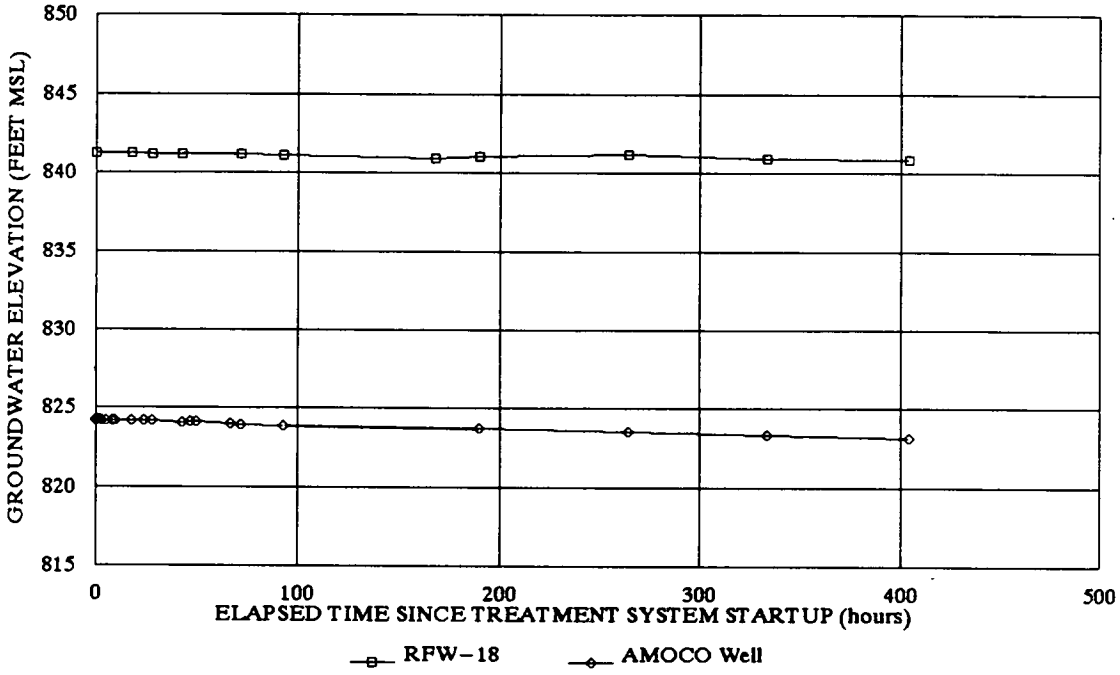




**FIGURE 2-1**
**HYDROGRAPHS OF SELECTED WELLS DURING TREATMENT SYSTEM TRIAL PHASE**
**Operational Plan**
**Black & Decker**
**Hampstead, Maryland**

95P-3055 6/13/95

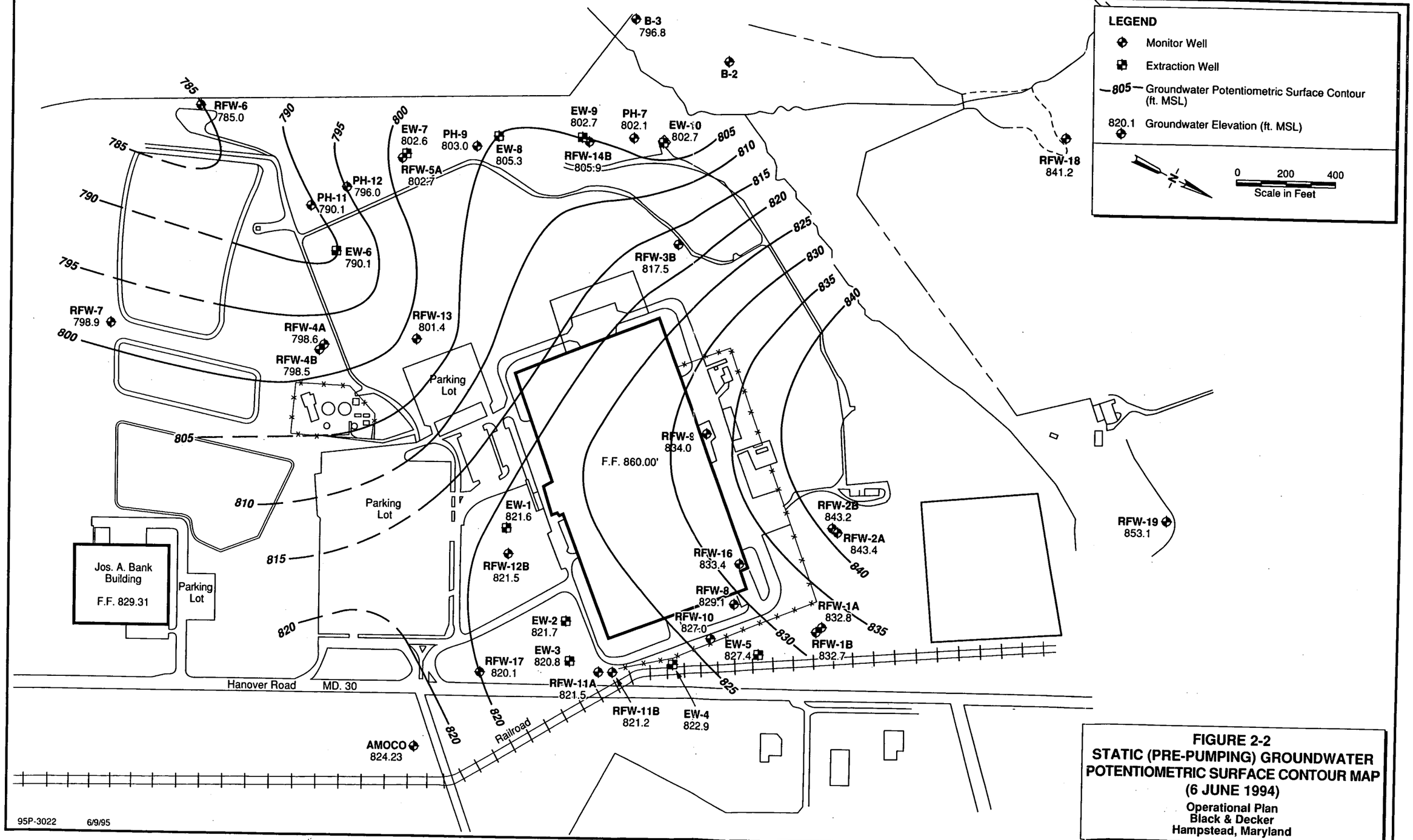



**FIGURE 2-2**
**STATIC (PRE-PUMPING) GROUNDWATER POTENTIOMETRIC SURFACE CONTOUR MAP (6 JUNE 1994)**
Operational Plan
Black & Decker
Hampstead, Maryland

95P-3022 6/9/95

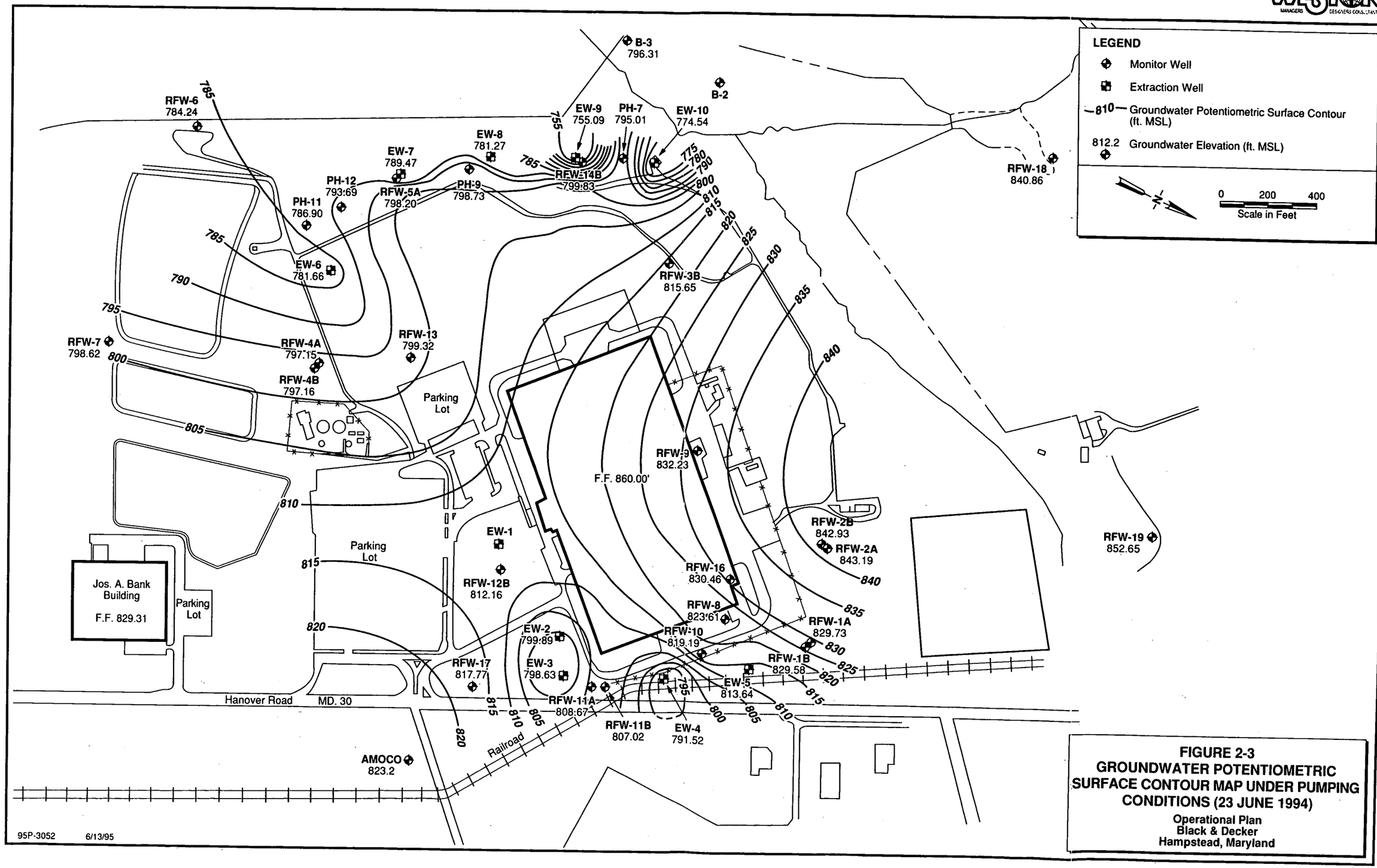



**FIGURE 2-3**
**GROUNDWATER POTENTIOMETRIC SURFACE CONTOUR MAP UNDER PUMPING CONDITIONS (23 JUNE 1994)**
**Operational Plan**
**Black & Decker**
**Hampstead, Maryland**

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