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CONSTRUCTION CERTIFICATION REPORT

ARMONK PRIVATE WELLS SITE
SITE 3-60-005

WORK ASSIGNMENT No. D003060-15

Prepared for:



New York State Department of Environmental Conservation
50 Wolf Road
Albany, New York 12233-7010

Prepared by:

TAMS Consultants, Inc.
The TAMS Building
655 Third Avenue
New York, NY 10017

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EXECUTIVE SUMMARY

The objective of this construction certification report is to document the work activities pertaining to the remediation of the Armonk Private Wells Site, in Armonk, New York. The New York State Department of Environmental Protection (NYSDEC) contracted TAMS Consultants, Inc. (TAMS) to provide engineering and construction management services during remediation.

In 1979, the Westchester County Health Department discovered solvents in the Armonk groundwater near dry cleaning establishments. Various agencies conducted soil and groundwater testing on-site to define the nature and extent of contamination. A record of decision (ROD) was signed in 1990 to address the contamination on-site. The major components of the selected remedy were as follows: removal of the septic tanks; provision for a municipal water supply; groundwater restoration by pumping and on-site treatment using carbon adsorption; and continued monitoring. The septic tank contents were removed in 1991 and the municipal water supply was completed in 1992. Additional investigations were performed on-site to better characterize the aquifer. In 1995 a conceptual design was prepared by TAMS that consisted of a pump and treat system with three groundwater extraction wells, a carbon adsorption treatment unit, and discharge of treated water to the Wampus River. This conceptual design was approved by NYSDEC. Based on this conceptual design, TAMS subsequently performed the remedial design to address the groundwater contamination at this site.

TAMS prepared the contract documents for NYSDEC. Subsequently, NYSDEC publicly bid the contract and awarded the remediation contract to the low bidder, EnviroTrac, Ltd. (ET), Deer Park, New York. The Notice to Proceed was issued by NYSDEC on September 8, 1997.

Work completed by EnviroTrac included:

- Clearing and grubbing the site;
- Installation of two extraction wells and modification of a third extraction well;
- Construction of a water treatment building;
- Installation of extraction well pumps, sensors and controls;
- Water treatment system construction;
- Verification sampling and analysis;
- Modification of two existing monitoring wells and abandonment of six others;
- Site restoration; and
- Six months of operation and maintenance.

ET began work on-site on September 19, 1997 and was substantially complete by April 8, 1998. The six-month operation and maintenance period was from April 9, 1998 to October 9, 1998. A final inspection was conducted on October 15, 1998 and a punchlist of remaining work items was generated, which ET completed. In general, the work performed by the contractor was in conformance with the contract documents issued by NYSDEC.

1.0 INTRODUCTION

1.1 Scope of Report

The objective of this construction certification report is to document the work activities pertaining to the construction of an on-site groundwater recovery and treatment system at the Armonk Private Wells Site (Site No. 3-60-005) in conformance with the New York State Department of Environmental Conservation (NYSDEC) contract documents, dated December 1996. The NYSDEC contracted TAMS Consultants, Inc. (TAMS) to provide engineering and construction management services during construction. EnviroTrac, Inc. (ET) was contracted by NYSDEC to construct the various components of the remedial treatment system.

1.2 Background Information

The Armonk Private Wells Site (AWS) is approximately 34 acres in size and is located in the central business district of the Hamlet of Armonk, Town of North Castle, Westchester County, New York. The site is bounded by the Wampus River to the east, Bedford Road to the south, Route 128 (Main Street) to the west, and the northern end of the A&P Shopping Center to the north. The site is comprised of approximately 55 private homes and 13 small businesses. Refer to Figures 1 and 2 for the Site Location Map and the Site Map, respectively.

The geology at the site generally consists of a gneissic bedrock overlain by glacial sands. The bedrock surface, encountered at depths from approximately 10 feet to greater than 125 feet, slopes from the north-northwest to the south-southeast. The overburden soils generally consist of sand with varying amounts of silts and gravels.

Based on water table contours developed from water level measurements taken during the RI, the groundwater flow at the AWS is approximately from northwest to southeast in the shallow overburden for most areas of the site. However, in the bedrock/deep overburden in the middle of the site, the groundwater flow appears to be from west to east. It appears that there is a layer of clayey silt and a layer of sand and silt overlying the bedrock to the south-southeast of the site. Also, there is a layer of silt overlying the bedrock to the north of the site. Laterally between the above-mentioned units, the bedrock is overlain by a layer of sand and gravel from west to east. It appears from the contaminant migration pattern observed from the supply well data collected during the RI that the groundwater flow in the bedrock/deep overburden is predominantly through the sand and gravel formation, from west to east.

In 1978, the Westchester County Health Department (WCHD) initiated a study in Westchester County to evaluate groundwater quality in the vicinity of historic and current dry cleaning establishments. As part of this study, the WCHD sampled and analyzed 36 water supply wells at the

AWS in March 1979. Samples from nine of these wells contained halogenated alkene solvents at concentrations in excess of the New York State Department of Health (NYSDOH) standards. The primary contaminants detected in these wells were tetrachloroethene (perchloroethene, (PCE)), trichloroethene (TCE), and cis-1,2-dichloroethene (DCE).

Since the initial WCHD sampling event in March 1979, approximately 68 separate private and commercial water supply wells in the Armonk area have been sampled and tested by the WCHD and the United States Environmental Protection Agency, Region II Technical Assistance Team (USEPA-TAT). From March 1979 through April 1987, more than 350 samples were collected and analyzed. In samples from 50 of the 68 water supply wells sampled, TCE and PCE were detected at concentrations exceeding the NYSDOH standards. Contaminants were not detected in samples collected from the remaining 18 wells sampled.

Wehran Engineering, P.C. (Wehran) completed a NYSDEC Phase I Investigation of the AWS in June 1983 and a NYSDEC Phase II Investigation of the site in June 1985. The Phase I study identified several supply wells as being contaminated with halogenated compounds and concluded that the site posed a potential health threat to the surrounding population. The Phase II study developed a hazard ranking system score (HRS) for the AWS; the migration score (Sm) was determined to be 37.9, reflecting the potential for harm to humans and the environment due to migration of groundwater and surface water.

In 1987, the NYSDEC retained TAMS Consultants, Inc. (TAMS) and its subconsultant, Goldberg-Zoino Associates of New York, P.C. (GZA) to conduct a Remedial Investigation/Feasibility Study (RI/FS) of the AWS. The RI identified three sources of contamination. Source No. 1 is a former dry cleaning establishment (396 Limited) located at 400 Main Street. This facility was in operation from 1974 through 1979. Based upon conversations with the Armonk Building Inspector, the former septic tank and leach field for this facility discharged at a location approximately 10 to 30 feet southeast of the building. Conversations with Armonk residents revealed that the former operator of the dry cleaning shop temporarily stored the spent solvent in a tank and may have discarded the contents of the tank behind the building.

Source No. 2 is a former dry cleaning establishment (Country Cleaners) located on Maple Avenue. Prior to 1984, this facility discharged wastes through a private septic system which included several leach lines inside the fenced area behind the building. In 1984, the facility was connected to the town sanitary sewer system. The former septic system was sampled during the RI and high levels of PCE, TCE, and DCE were detected. While the owner purchased the building in 1956, the date of commencement of the dry cleaning business is not known. The building is currently occupied by a curio shop.

Source No. 3 is a dry cleaning establishment (Cleaning by Frederick's) located at the A&P Shopping Center which was built in 1967. Prior to connection to the town sanitary sewer system in 1984,

wastes were discharged into a leach field behind the facility.

Data obtained during the previous investigations and the RI indicated that there is contamination in the vadose zone; and saturated overburden and bedrock aquifers.

In March 1990, the NYSDEC issued a Record of Decision (ROD) for the AWS. The ROD presented the remedial actions selected by the NYSDEC as being the most appropriate for the site based on findings of the RI/FS. The major components of the selected remedy are as follows:

- Removal and off-site treatment of liquid wastes and sludges from septic tank(s) and removal and off-site disposal of septic tank materials;
- Soil gas collection by vacuum extraction with on-site treatment of extracted gases using carbon adsorption;
- Provision for a municipal water supply;
- Groundwater restoration by pumping and on-site treatment using carbon adsorption; and
- Monitoring of soil gas, groundwater, and the Wampus River pending completion of the remedial objectives.

Since the signing of the ROD, a number of response actions and investigations have been performed at the site. In 1990, the NYSDEC tasked Dunn Geoscience Corporation and TAMS, as its subcontractor, to address the septic tank behind the former Country Cleaners facility (Source No. 2). In March 1991, the contents of the tank were removed and drummed and the tank was cleaned, broken up, and left in place. In 1992, the USEPA completed a municipal water supply system as a remedial response for the site. All residences and businesses were connected to the system. The USEPA has also conducted additional soil gas and groundwater monitoring since 1992.

In 1995, TAMS completed Design Support Testing to fill gaps in the data necessary for the remedial design. Activities performed during that program included a source investigation, well installation, groundwater sampling, and a 48-hour pumping test. Subsequently, TAMS performed a conceptual design for groundwater remediation at this site. The conceptual design consisted of a pump and treat system with three groundwater extraction wells, a carbon adsorption treatment unit, and discharge of treated water to the Wampus River.

1.3 Remedial Design and Contractor Procurement

The NYSDEC contracted TAMS to provide engineering and construction management services during implementation of the remedial action for this site. These services were provided under the State Superfund Standby Program Work Assignment Nos. D003060-1 and D003060-15. TAMS designed the groundwater remediation system and prepared design drawings, technical specifications and a design report for the Armonk Wells Site. NYSDEC issued the contract documents for groundwater remediation during January 1998. The bid opening was held on January 21, 1997. A summary of the bids that were received and the engineer's estimate is presented in Table 1 - Bid Tabulation Sheet. On January 27, 1997, NYSDEC informed ET that they were the apparent low bidder.

1.4 Construction

A Notice to Proceed was issued to ET on September 8, 1997 to begin work on-site. The project team consisted of the NYSDEC, who acted as the owner of the project site during construction, TAMS, who provided engineering and construction management services and ET who served as the construction contractor who performed the work on-site. The staffing and responsibilities of each party are presented in the following paragraphs.

1.4.1 NYSDEC Staff

The construction work activities at the AWS were under the New York State Standby Superfund Contract, which is managed by the NYSDEC. Mr. Robert Knizek, PE was the NYSDEC authorized representative to execute the contract.

Mr. Dan Evans served as the NYSDEC project manager from the commencement of the project until February 3, 1998 and Mr. Joseph Yavonditte, PE served as the NYSDEC project manager from February 3, 1998 until the completion of the project. As the project manager, both made final decisions on acceptability of the work based on information and recommendations provided by TAMS. The project managers' responsibilities included seeing that the project proceeded satisfactorily according to the NYSDEC interests and keeping key personnel informed of work progress. Both also interacted with TAMS throughout the duration of the project, inspected the project site on a bimonthly basis, and attended progress meetings.

1.4.2 TAMS Staff

TAMS provided engineering and construction management services throughout the duration of the project. Mr. Mike Thiagaram, PE served as the TAMS' project manager and as a liaison between the NYSDEC and the General Contractor. He was responsible for maintaining the work schedule

and providing guidance to the TAMS resident inspectors.

Mr. John Egan, Mr. Muhammad Akbar, Ms. Pamela Pierce and Mr. Richard B. Reiss were the TAMS resident inspectors throughout the duration of the project. The resident inspector was responsible for providing full time inspection of construction activities at the project site and verifying construction procedures were performed in accordance with the approved contract documents. Other duties of the TAMS resident inspector included completion of daily field reports, change order tracking while maintaining written and photographic records (Appendix A) of work completed during construction.

1.4.3 EnviroTrac Staff

ET was the general contractor throughout the duration of the project. Mr. Ted Masters served as ET's project manager throughout the duration of the project. Mr. Masters was responsible for coordinating work activities with subcontractors and TAMS. Both Mr. Ted Masters and Mr. Dale Konas served as the on-site superintendent during the project period. ET established temporary services and facilities; ordered supplies and equipment; provided health and safety monitoring; constructed the treatment building and installed the carbon treatment system. Several other aspects of the contract were subcontracted to other firms. Table 2 presents a list of subcontractors hired by ET during the construction, along with their major responsibilities.

2.0 SUMMARY OF CONSTRUCTION ACTIVITIES

2.1 Introduction

The Notice to Proceed was issued to ET on September 8, 1997. EnviroTrac mobilized on September 18, 1997 to the site. The site was closed and no work performed for a one month period as there was a delay in the fabrication of the carbon treatment system. ET began the six-month operation and maintenance period on April 9, 1998. A final inspection occurred on October 15, 1998. A more detailed schedule breakdown is provided in Figure 3.

2.2 Site Preparation

ET began mobilization on September 18, 1997. A site trailer was rented from Hertz. This trailer remained on-site until May 1998. A temporary electrical pole for site utilities was installed. PM Pole Line, Inc. installed electrical service to the site and later returned to the site to repair an overhead power wire. The electrical subcontractor, CG Electric, Inc., began installation of electrical and phone services on October 15, 1997. CG Electric, Inc. installed the electrical meter and provided the electricity service.

Clearing of vegetation, small trees and brush occurred during site preparation. A 20-cubic yard roll-off container containing cleared vegetation and some concrete was disposed off-site by Diversified Waste Disposal. This material was to be sorted and recycled at their facility in Danbury, CT.

2.3 Health and Safety

ET prepared the Health and Safety Plan and performed on-site monitoring during intrusive activities. ET conducted air monitoring using a PID, aerosol monitor and MiniRam from October 9, 1997 to November 3, 1997. No elevated readings were detected. Readings were documented by Mr. Ted Masters and maintained on-site. The air sampling results are included in Appendix B.

The level of protection for workers for the majority of the work performed on-site was typical Level D protection (field clothes and steel toe boots).

Burns Security provided site security services during work hours from August 7, 1995 to October 23, 1995. After daily work was completed, the site was patrolled every six hours.

2.4 Extraction Well Installation

Three extraction wells (EW1, EW2, EW3) comprise the groundwater extraction system. EW1 and EW3 were newly installed. EW2 was constructed via the modification of AW201R, a well installed during Design Support Testing for performing the pumping test. ET began extraction well installation on October 13, 1997. Extraction well locations are shown on Figure 2. The boring logs are presented in Appendix C.

EW1 was drilled using the air rotary drilling method. As there was a significant amount of silt encountered during drilling, it was decided to screen from the gravel zone to the bottom of the hole to avoid the silt. The sand pack was changed from a #2 to a #1 morie sand. The water produced during the drilling of this well was initially contained in a plastic lined 20-cubic yard dumpster and then discharged into the sanitary sewer system following VOC analysis and approval by the local sewer and water district. EW1 was installed in bedrock to a depth of 89 feet. The well was constructed of flush joint threaded, 8 inch ID schedule 80 PVC. The annulus was gravel packed and grouted as per the technical specifications.

EW2 was constructed by modifying the 6-inch monitoring well AW201R. The modifications included wellhead reconstruction to house the equipment necessary for use as an extraction well.

The installation of EW3 was completed on October 16, 1997. During construction of the well, the filter sand was changed from a #2 to a #1 Morie sand. A ten foot thick gravel layer was encountered approximately 80 feet below ground surface (BGS). This gravel layer yielded a large flow of groundwater into the borehole which was discharged to onsite infiltration trenches and allowed to percolate into the ground. This recovery well was terminated at 138 feet BGS instead of 150 feet as indicated on the initial drawings. On October 23, 1997, the depth of the well was measured at 111 ft BGS although it should have been 138 ft BGS. Upon subsequent investigation by ET, a mixture of bentonite, silt and rock dust was discovered in the bottom of the well. The rock dust may have come from the air rotary drilling in bedrock and the bentonite from the significant loss of bentonite/grout noted during installation of the well. The silt may have been from residues of drilling operations or from the formation adjacent to the well. The mixture of bentonite, silt and rock dust was removed from 112' to 128' BGS.

After installation, all three extraction wells were developed to less than 50 NTU. The development water was discharged to the sanitary sewer at a rate not exceeding 1,000 gallons per day. On some occasions, ET generated more than 1,000 gallons during development. The excess development water was stored in a 500-gallon poly tank for subsequent discharge to the sanitary sewer at a later date.

After development, ET installed a submersible pump, a water level transducer, a pressure transmitter

and a pitless adapter into each extraction well. The pitless unit was pressure tested to 50 psi. The water level transducer measures the water level above the pump and is used to turn the pump on and off. The pressure transmitter monitors the pipe discharge pressure. If the pipe pressure exceeds 50 psi, the pump is shut off by the Procontrol system installed in the treatment building for the overall control of system operation. The pitless adapter is used to transfer the groundwater from the submersible pump to the buried PVC pipes. The main advantage in using a pitless adapter is that it allows for the easy removal of the submersible pump from the extraction well.

2.5 Trench Excavation and Pipe Installation

ET dug the influent trenches and installed 1" HDPE water line piping, 2" PVC influent piping and 2" PVC electrical and control conduits. The locations of the pipes and conduits are presented in Appendix I. EnviroTrac was directed by the Engineer to place the influent piping below the water line to prevent potential cross contamination of the water supply upon pipe failure. The pipes were placed below the frost line to prevent the pipes from freezing. The influent pipes were successfully pressure tested at 50 psi for 30 minutes. The PVC conduits contained either the control wiring or the electrical wiring from the treatment building to the wellheads.

The effluent pipe was placed in sections and successfully pressure tested with water to 5 psi for 10 minutes. Once a section passed the pressure test it was backfilled. Cushion sand was placed around the pipe and the native backfill was compacted using a vibratory plate compactor. The conduit for the level sensor in catch basin CB-4 was installed in a trench along Bedford Road.

It should be noted that buried pipes including a PVC sewer pipe, a cast iron pipe and an iron pipe were discovered near the historic building during the digging of the discharge trench. None of these pipes were damaged during installation of the discharge pipe.

The potable water supply to the treatment building was installed by ET. ET tapped into an 8" ductile iron pipe water main and installed a water supply manhole, a curb stop (provided by the Town of Armonk) and a shut-off valve. After consulting the water department, ET tested the water line to 100 psi.

2.6 Treatment Building

Backfill for the foundation was compacted and tested by Fairway testing. Concrete and stone encountered during excavations were buried on-site.

There were problems noted during the installation of the concrete for the footer. On one occasion, the first concrete slump test result was 2½". However, the truck operator added more water to the concrete truck after the first slump test was taken. A second slump test was performed. The result was a slump of 6½". This was outside the specification limit of 4". Four concrete cylinders were

taken for testing. TAMS noted that the concrete test results for this pour were 50% lower than previous concrete pours at seven days. However, the cylinder achieved greater than 3,000 psi strength at 28 days and passed the strength test.

EnviroTrac's subcontractor Globe Atlas had problems installing the waterstop. The original waterstop had to be removed as nails, compromising the integrity of the waterstop, were driven through the center bulb. Global Atlas installed a nail-on type waterstop which was recommended by TAMS.

EnviroTrac began construction of the Parkline Treatment building on January 5, 1998. Construction was completed on February 16, 1998. ET obtained a building permit from the Town of North Castle, a copy of which is included in Appendix D. The treatment building is a prefabricated sheet metal building that is installed on-site. ET elected to install the building using its own crew. A copy of the treatment building record drawings are included in Appendix I.

Within the treatment building, wall mounted piping was supported with Kindorf support channels, toggle bolts and 3" screws and washers on both sides of the water treatment building wall. Suspended piping was supported with square anchors, straps and Kindorf support channels. All piping and conduit entrances to and from the building were properly sealed. All internal piping was successfully pressure tested in the following manner: pipes were pressurized to 20 psi for 15 minutes, pressure was then maintained for one hour with less than a 0.5 psi pressure drop. Initially, ET experienced difficulties passing the test due to cracked pipes, leaky seals between pipe fittings and improper sealing of pipes. After the problems were addressed, these pipes and fittings passed the pressure tests.

The joint between the floor slab and the foundation inside the treatment building was properly sealed with polyurethane concrete and masonry sealant. ET removed all sediment and liquid from the joint using rags and an air compressor prior to application of the sealant.

CG Electric installed indoor conduits and wiring along the ceiling and the building perimeter at floor level.

2.7 Groundwater Treatment System

CG Electric, a subcontractor to ET, installed the electrical and control wiring and conduits associated with the groundwater treatment system. The locations of control and electrical wiring for the building interior and exterior are presented in Appendix I.

The groundwater treatment system consists of two bag filters followed by two carbon units. The specifications on the carbon units are presented in Appendix E. The groundwater is pumped from

three extraction wells (combined influent is approximately 60 gpm) through two 10 micron bag filters in parallel, then through two 6,000 lb. granular activated carbon units in series. Next, the groundwater is fed to a 300-gallon effluent holding tank. From the effluent holding tank, the treated groundwater is pumped using a 1/3 hp pump to a catch basin on Bedford Road. From there, the water flows via gravity to the Wampus River. Initially, the groundwater treatment system was designed to flow through the bag filters in series. However, the high sediment loading caused the first bag filter to clog regularly. It was then decided to operate the filter bags in parallel in order to reduce the bag filter operation and maintenance requirements by decreasing the sediment loading on each bag filter.

Once the bag filters are clogged with sediment, they are removed from the bag filter housing and new bag filters are installed. It was decided to sample a clogged bag filter to determine the proper method of disposal of the bag filter. A sample of a clogged bag filter was sent to a laboratory for waste characterization. A TCLP test was performed. Results indicated that the bag filter was non-hazardous. Therefore, the bag filters are disposed as regular solid waste. A copy of the bag filter sampling results are included in Appendix H.

Wastewater generated in the water treatment building is drained into the sump pit via a perimeter drain. Sump pit wastewater is pumped with a 1 hp sump pump through an in-line filter before this water joins the untreated influent from the extraction wells. ET installed a 1" PVC gate valve in the sump piping to regulate flow to the in-line filter.

As per the New York State Department of Environmental Conservation Division of Water Effluent Limitations and Monitoring Requirements, 86,400 gpd of treated groundwater may be discharged to the Wampus River from May 1, 1996 to May 1, 2001 provided the discharge limitations are not exceeded and the minimum monitoring requirements are met. The Effluent Limitations and Monitoring Requirements are presented in Appendix F. Effluent sampling results have been in compliance with the Effluent Limitations and Monitoring Requirements. The Water Treatment Sampling Plan as implemented by ET is shown in Table 3 while a summary of Water Treatment Sampling Results is presented in Table 4. A copy of all Water Treatment Sampling Results including QA data is presented in Appendix G. Upon completion of ET's operation and maintenance period, ET had successfully treated approximately 8.3 million gallons of groundwater.

2.8 Process Instrumentation and Control

EOS Research Ltd. assembled, installed and tested the process instrumentation and control system which includes the Procontrol Series II controller. CG Electric installed the conduit and wiring and brought power to the system. This system is housed in the control panel located inside the treatment building. A detailed drawing of the system logic and wiring is included in Appendix I. The system monitors extraction well discharge line pressures, individual extraction well flows, bag filter

differential pressure, carbon unit differential pressure, in-line filter differential pressure, AC power failure and water levels in the extraction wells, wastewater sump pit, effluent tank and catch basin. When an alarm condition occurs, the modem faxes an alarm report to two fax numbers and pages an alarm code (which corresponds to an alarm condition) to two pagers. Under certain alarm conditions, the Procontrol Unit shuts all pumps off and pages and faxes the cause of the alarm. The system alarms were successfully tested prior to system startup.

On April 9, 1998, a faulty system modem was replaced with a new modem. On May 29, 1998, a brownout resulted in five days of downtime. On June 3, 1998, ET changed fuses, reprogrammed the Procontrol Unit and brought the system back online.

ET repeatedly had problems with the Omega discharge pressure transducers used in EW1, EW2 and EW3. The discharge pressure transducers were replaced with Ashcroft transducers housed in a transducer box inside each extraction well manhole.

2.9 Start Up Operation

The one month start up period began March 6, 1998. The system was in operation for a minimum of eight hours a day, five days a week. ET collected groundwater samples for volatile organic compounds (VOCs), iron and manganese analyses daily for the first five operating days and weekly thereafter during the 3-week start up period. Prior to obtaining the analytical results from Upstate Laboratories, the processed water was temporarily stored in a separate 21,000 gallon frac tank. The 24-hour turnaround analytical results indicated that the water samples met the discharge requirements. The processed water was then drained by both gravity and siphoning into the effluent holding tank discharge line which discharges to a catch basin on Bedford Road.

NYSDEC and ET agreed to begin the long term test (60 hour) in the third week of startup instead of the fourth week to allow ET additional time to resolve any problems that may have developed during the long term test without extending the one month startup period. The long term test began on April 6, 1998 and ended on April 8, 1998. Approximately 305,000 gallons of groundwater were processed during the startup period.

2.10 Operation and Maintenance

The six-month operation and maintenance period began on April 9, 1998 and ended on October 9, 1998. During the operation and maintenance period, ET maintained an Alarm Response Log (Table 5) and an Operation and Maintenance Log (Table 6).

Sediment buildup in the bag filters was a reoccurring problem during the first several months of operation. The pump at EW3 was raised 10' and groundwater was pumped to a contained area onsite

for two hours until the groundwater became clear. A grey sediment, resembling bentonite, blanketed the floor of the pooled water. The piping was then reassembled such that the water ran through the treatment system. Subsequently, the filter bag clogging gradually decreased, resulting in biweekly bag filter changes. During a weekly sampling event, a small amount of sediment was visible at the bottom of the EW2 sampling jar. EW2 was temporarily shut off to isolate the solids loading source. It was determined that EW2 was not contributing more solids than the other wells. Thus, EW2 was turned on and the system subsequently ran with all three wells in operation.

ET repeatedly replaced leaky EW piping into the building to stop the leaking. Reinstallation of the pressure release valves was required to prevent these valves from leaking.

In late March 1998, analysis of the effluent sample, EFF032398, resulted in tetrachloroethene concentrations which exceeded discharge limits. ET was not permitted to discharge treated groundwater until ET had successfully proven that the treatment system effectively treated the contaminated groundwater. ET provided analytical data from the reanalysis of EFF032398 ($<.5 \mu\text{g/L}$ tetrachloroethene) and explained that the discharge exceedance was a laboratory error (improper storage at the laboratory). NYSDEC gave ET permission to continue treating and discharging water based on the non-detect reanalysis results. Subsequent sampling results indicated that the VOC levels in the effluent were non-detect.

2.11 Monitoring Well Modifications and Abandonment

The Contractor modified and refurbished wellheads of existing monitoring wells including AW1R and AW205R. In addition, six monitoring wells were abandoned (AW1S, AW1D, AW12, AW13, AW2, and AW3). Monitoring well modifications and abandonment work commenced on April 22, 1998 and ended on May 11, 1998. The work was performed on a time and materials basis.

The modification procedure involved removing the existing AW1R and AW205R monitoring well skirts and replacing them with 12" diameter, 8" long and 12" diameter, 12" long monitoring well skirts, respectively. The tops of the monitoring well skirts were approximately 2' above final grade. The locking monitoring well caps were replaced with Envirocaps and a concrete form was placed around the skirt. The concrete form around AW1R shifted when weight was applied to the corners. ET excavated and placed more concrete around the form. This stabilized the concrete form.

The decommissioning procedure used was grouting in-place, as per NYSDEC guidelines (Sections 2.3 and 9 of the revised October 1996 NPL Site Monitoring Well Decommissioning, NYSDEC). The procedure involved breaking the concrete around the well, then removing the top portion of the casing (to one to four feet below grade) and associated well materials from the ground. Next, the well was grouted to five feet from the top of casing. The remainder of the well space was filled with concrete and an additional ten cubic feet of concrete was placed around the top of the casing. The

hole was then backfilled and the waste generated from the process was collected and transported by ET for disposal.

2.12 Site Restoration

Utilities were removed from the trailer on April 20, 1998. The trailer was removed from the site on May 22, 1998.

During the installation of effluent piping and conduit, the asphalted road leading to Bedford Road and the parking lot owned by the Dentist were disturbed. The road was paved and NYSDOT Item No. 4 stone was placed in the Dentist's parking lot.

Topsoil and seed were placed around the treatment building and on the lawn on the south side of the building. In addition, a driveway and path consisting of geotextile (weed control), NYSDOT Item No. 4 stone and 6" x 6" treated lumber were installed to the treatment building.

Weed control geotextile and NYSDOT Item No. 4 stone were also placed around EW2 and EW3 to prevent weed growth around the wells.

2.13 Change Orders

After completion of the project, one change order was issued to ET. This change order included adjustments to unit and lump sum bid items in the contract. Included also were the costs incurred by ET in performing additional work on-site including but not limited to driveway installation, existing monitoring well modification and abandonment, alarm responses and installation of a sensor in the catch basin on Bedford Road. Additional details of this change order are included in Table 7 - Breakdown of Final Contract Price.

2.14 Miscellaneous

At the completion of the construction phase of the project, NYSDEC contracted TAMS to operate and maintain the system for six months before the water treatment system operation is turned over to NYSDEC.

3.0 CONSTRUCTION CERTIFICATE

**CONTAMINATED GROUNDWATER REMEDIATION AT
ARMONK PRIVATE WELLS SITE, SITE NO. 3-60-005, ARMONK, NEW YORK**

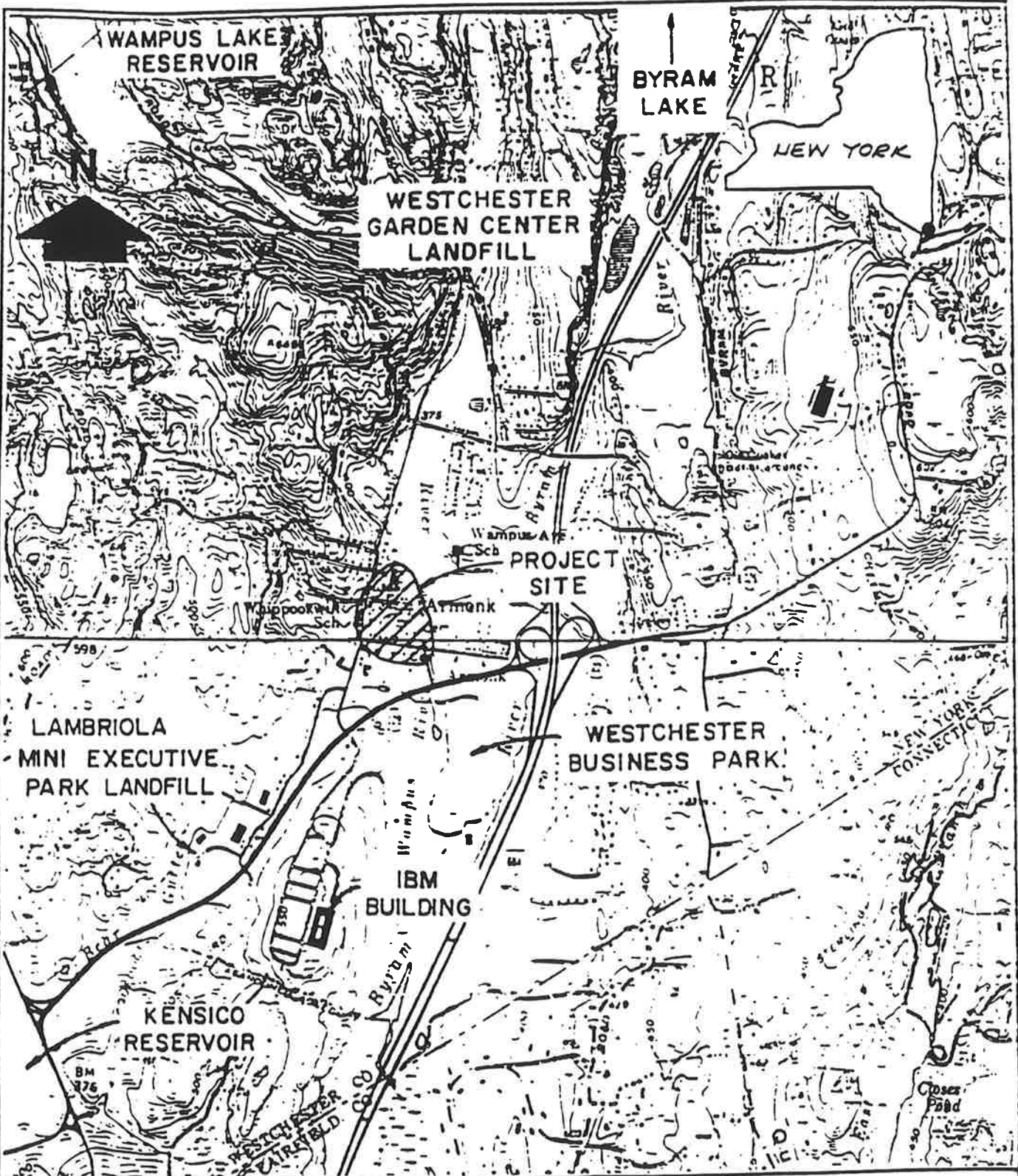
Remedial construction was completed in accordance with the Contract Documents, prepared by TAMS Consultants, Inc., entitled "Groundwater Remediation, Final Technical Specifications, Armonk Private Wells Site, Site No. 3-60-005, December 10, 1996" (TAMS/NYSDEC Superfund Standby Contract Work Assignment No. D003060-1) and as outlined in this Construction Certification Report.

PE STAMP

Signature: _____
TAMS Consultants, Inc.

Date: _____

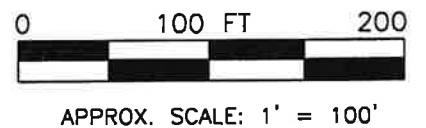
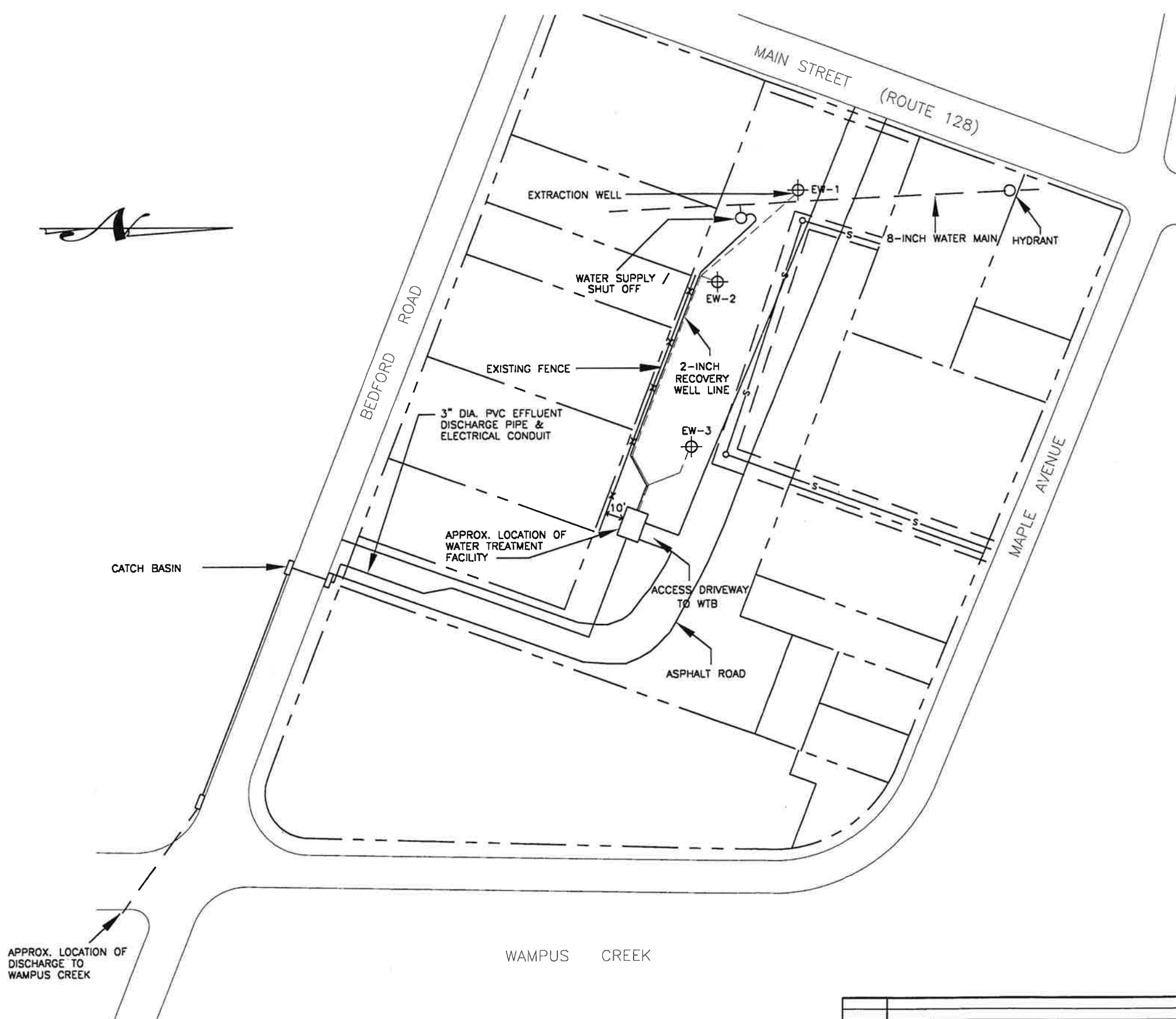
FIGURES



NOTE: BASE MAP ADAPTED FROM GLENVILLE & MT. KISCO, N.Y.-CONN - 1971 U.S.G.S. QUADRANGLE MAPS. SCALE: 1"=2000'

Source: Draft Remedial Investigation Report prepared by GZA, February 1989

Prepared by: TAMS CONSULTANTS, Inc.	ARMONK WELL SITE ARMONK, NEW YORK	SITE LOCATION MAP	
Prepared for: NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION		DATE: 2-14-89	FIGURE NO. 1



Prepared by : TAMS CONSULTANTS, Inc. The TAMS Building 655 Third Avenue, New York, New York		Prepared for : NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION 50 Wolf Road Albany, New York 12233	
DESIGNED BY : RR	ARMONK PRIVATE WELLS SITE Town of North Castle Westchester County, New York		
DRAWN BY : JE			
CHECKED BY : MT			
SUBMITTED BY : MT	DATE : DECEMBER 1998	SCALE : AS SHOWN	FIGURE NO. : 2

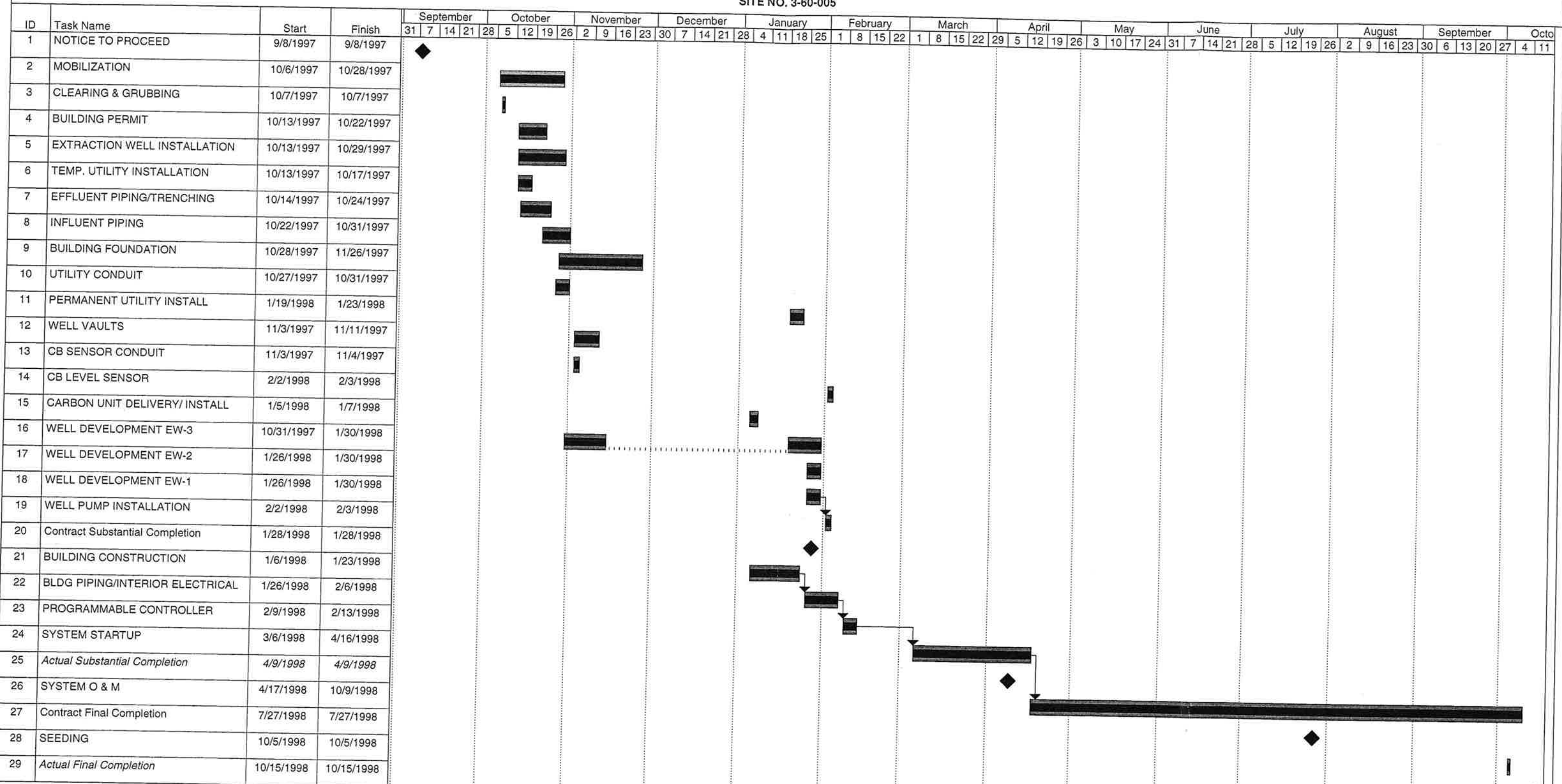
SYMBOL	DESCRIPTIONS	DATE	APPROVED

APPROX. LOCATION OF DISCHARGE TO WAMPUS CREEK

WAMPUS CREEK

Figure 3 - Actual Construction Schedule

ARMONK PRIVATE WELLS SITE
SITE NO. 3-60-005



Project: ARMONK PRIVATE WELLS
Date: December 22, 1998
FAMS Consultants, Inc.

Task [Bar] Split [Dotted] Progress [Thick Bar] Milestone [Diamond]

TABLES

Table - 1 Bid Tabulation Sheet

ARMONK PRIVATE WELLS SITE

Site No. 3-60-005

Bid Tabulation

January 21, 1997

Payment Item No. Description	Quantity Units	Engineer's Estimate		Envirotrac Ltd.		Earth Tech Inc	
		Unit	Extension	Unit	Extension	Unit	Extension
1 Mobilization/Demobilization	1 LS	\$41,828.00	\$41,828.00	\$80,000.00	\$80,000.00	\$45,000.00	\$45,000.00
2 Site Services	98 Day	\$167.34	\$16,399.32	\$316.00	\$30,968.00	\$245.00	\$24,010.00
3 Health and Safety	70 Day	\$355.71	\$24,899.70	\$143.00	\$10,010.00	\$535.72	\$37,500.00
4 Modify Existing Well	1 LS	\$8,673.00	\$8,673.00	\$10,000.00	\$10,000.00	\$6,000.00	\$6,000.00
5 New Groundwater Wells	1 LS	\$49,938.00	\$49,938.00	\$56,000.00	\$56,000.00	\$41,000.00	\$41,000.00
6 Concrete Manholes	1 LS	\$6,162.00	\$6,162.00	\$5,000.00	\$5,000.00	\$15,000.00	\$15,000.00
7a 2-inch PVC Pipe	710 LF	\$9.68	\$6,874.93	\$1.20	\$852.00	\$30.00	\$21,300.00
7b 3-inch PVC Pipe	725 LF	\$28.50	\$20,658.88	\$2.52	\$1,827.00	\$35.52	\$25,752.00
8 1-inch Copper Water Pipe	290 LF	\$6.66	\$1,930.99	\$1.87	\$542.30	\$20.18	\$5,852.00
9 Pre-Engineered Building	1 LS	\$36,334.00	\$36,334.00	\$50,000.00	\$50,000.00	\$47,200.00	\$47,200.00
10 Water Treatment Facility	1 LS	\$99,495.00	\$99,495.00	\$117,245.14	\$117,245.14	\$103,772.00	\$103,772.00
11 System Startup	1 LS	\$5,826.00	\$5,826.00	\$11,000.00	\$11,000.00	\$12,300.00	\$12,300.00
12 System Operation and Monitoring	6 MO	\$8,831.67	\$52,990.02	\$6,000.00	\$36,000.00	\$9,912.50	\$59,475.00
13 Outfall Structure	1 LS	\$5,325.00	\$5,325.00	\$10,000.00	\$10,000.00	\$11,395.00	\$11,395.00
14 Electrical Work	1 LS	\$64,542.00	\$64,542.00	\$25,000.00	\$25,000.00	\$26,800.00	\$26,800.00
Total			\$441,876.84		\$444,444.44		\$482,356.00

Payment Item No. Description	Quantity Units	Allstate Power Vac		ERD Environmental Inc		Moretrench Environmental	
		Unit	Extension	Unit	Extension	Unit	Extension
1 Mobilization/Demobilization	1 LS	\$45,000.00	\$45,000.00	\$46,675.00	\$46,675.00	\$80,991.00	\$80,991.00
2 Site Services	98 Day	\$340.00	\$33,320.00	\$721.00	\$70,658.00	\$500.00	\$49,000.00
3 Health and Safety	70 Day	\$930.00	\$65,100.00	\$1,355.00	\$94,850.00	\$900.00	\$63,000.00
4 Modify Existing Well	1 LS	\$16,300.00	\$16,300.00	\$31,034.82	\$31,034.82	\$15,315.00	\$15,315.00
5 New Groundwater Wells	1 LS	\$59,000.00	\$59,000.00	\$53,321.40	\$53,321.40	\$54,585.00	\$54,585.00
6 Concrete Manholes	1 LS	\$21,300.00	\$21,300.00	\$9,360.00	\$9,360.00	\$27,838.00	\$27,838.00
7a 2-inch PVC Pipe	710 LF	\$10.00	\$7,100.00	\$21.55	\$15,300.50	\$41.30	\$29,323.00
7b 3-inch PVC Pipe	725 LF	\$30.00	\$21,750.00	\$27.76	\$20,126.00	\$73.40	\$53,215.00
8 1-inch Copper Water Pipe	290 LF	\$23.00	\$6,670.00	\$22.38	\$6,490.20	\$55.30	\$16,037.00
9 Pre-Engineered Building	1 LS	\$55,000.00	\$55,000.00	\$64,620.00	\$64,620.00	\$76,621.00	\$76,621.00
10 Water Treatment Facility	1 LS	\$200,000.00	\$200,000.00	\$176,729.60	\$176,729.60	\$181,641.00	\$181,641.00
11 System Startup	1 LS	\$30,700.00	\$30,700.00	\$40,920.00	\$40,920.00	\$23,906.00	\$23,906.00
12 System Operation and Monitoring	6 MO	\$12,340.00	\$74,040.00	\$10,568.33	\$63,409.98	\$10,906.00	\$65,436.00
13 Outfall Structure	1 LS	\$13,000.00	\$13,000.00	\$10,620.00	\$10,620.00	\$16,970.00	\$16,970.00
14 Electrical Work	1 LS	\$36,000.00	\$36,000.00	\$32,332.00	\$32,332.00	\$45,634.00	\$45,634.00
Total			\$684,280.00		\$736,447.50		\$799,512.00

Table - 2 List of ET's Subcontractors

Armonk Private Wells Site
Site No. 3-60-005
Contract No. D003635

No.	Subcontractor	Major Responsibilities
1	PM Pole Line, Inc.	Installation of electrical service pole, repair overhead wire
2	CG Electric	Installation of electrical service, conduit and wiring
3	Globe Atlas Construction Corporation	Constructed building foundation
4	Fairway Testing	Compacted and tested backfill for foundation
5	Kayler Geoscience	Soil/concrete testing
6	County Marking Co., Inc.	Asphalt paving
7	Burns Security	Security
8	Raymond E. Heinsman, P.L.S., P.P.	Surveyor
9	CT&E Environmental Services Inc.	Drillers
10	Hertz	Trailer and equipment rental
11	Parkline	Treatment building manufacturer
13	Calgon Carbon	Carbon system supplier
14	EOS Research Ltd.	Supervisory control and data acquisition; logic control
15	Baker Tanks	Frac tank rental
16	Diversified Waste Disposal	Waste Disposal
17	BEE & JAY	Plumbing
18	Winkler's Nursery	Site grading and seeding

Well 1 Well 2 Well 3 Combined After bag filter After GAC 1 Final 24 HR 2 DAY 14 DAY

Week 4

22 M	VOC		1		1	1		3
	Zn, Fe		1	1		1		3
23								
24								

System Startup Complete

Week 5

29 M	VOC		1		1	1		3
	Zn, Fe		1	1		1		3

Week 6

36 M	VOC		1		1	1		3
	Zn, Fe		1	1		1		3

Week 7

43 M	VOC		1		1	1		3
	Zn, Fe		1	1		1		3

Week 8

50 M	VOC		1		1	1		3
	Zn, Fe		1	1		1		3

Week 9

57 M	VOC		1		1	1		3
	Zn, Fe		1	1		1		3

Week 10

64 M	VOC		1		1	1		3
	Zn, Fe		1	1		1		3

Week 11

71 M	VOC		1		1	1		3
	Zn, Fe		1	1		1		3

Week 12

78 M	VOC		1		1	1		3
	Zn, Fe		1	1		1		3

Week 13

85 M	VOC		1		1	1		3
	Zn, Fe		1	1		1		3

Week 14

92 M	VOC		1		1	1		3
------	-----	--	---	--	---	---	--	---

or

Influent

Inbetween

Effluent

Hrs		Well 1	Well 2	Well 3	Combined	After bag filter	After GAC 1	Final	24 HR	2 DAY	14 DAY
Week 15	Zn, Fe				1	1		1			3
99 M	VOC				1						
	Zn, Fe				1		1	1			3
Week 16						1		1			3
106 M	VOC				1						
	Zn, Fe				1		1	1			3
Week 17						1		1			3
113 M	VOC				1						
	Zn, Fe				1		1	1			3
Week 18						1		1			3
120 M	VOC				1						
	Zn, Fe				1		1	1			3
Week 19						1		1			3
127 M	VOC				1						
	Zn, Fe				1		1	1			3
Week 20						1		1			3
134 M	VOC				1						
	Zn, Fe				1		1	1			3
Week 21						1		1			3
142 M	VOC				1						
	Zn, Fe				1		1	1			3
Week 22						1		1			3
149 M	VOC				1						
	Zn, Fe				1		1	1			3
Week 23						1		1			3
156 M	VOC				1						
	Zn, Fe				1		1	1			3
Week 24						1		1			3
163 M	VOC				1						
	Zn, Fe				1		1	1			3

Table 4 - Water Treatment Sampling Results Summary

ARMONK PRIVATE WELLS SITE
EFFLUENT
ANALYTICAL DATA

Date Sampled	Discharge Limits- SampleID	Concentration (ug/L)						750 Iron, total	250 Zinc, total
		2.5 Tetrachloroethylene	10.0 Trichloroethylene	10.0 1,2-cis-Dichloroethylene	10.0 1,2-trans-Dichloroethylene	10.0 Vinyl Chloride			
10-Mar	EFF031098	< 0.5	< 1	< 1	< 1	< 1	100	10.0	
16-Mar	EFF031698	< 0.5	< 1	< 1	< 1	< 1	71	14.7	
16-Mar	EFF031698	< 0.5*	< 1*	< 1*	< 1*	< 1*	NA	NA	
17-Mar	EFF031798	1.0	< 1	< 1	< 1	< 1	233	42.9	
17-Mar	EFF031798	< 0.5*	< 1*	< 1*	< 1*	< 1*	NA	NA	
18-Mar	EFF031898	1.0	< 1	< 1	< 1	< 1	<60	21.0	
18-Mar	EFF031898	< 0.5*	< 1*	< 1*	< 1*	< 1*	NA	NA	
23-Mar	EFF032398	< 0.5	< 1	< 1	< 1	< 1	<60	44.9	
23-Mar	EFF032398	< 0.5	< 1	< 1	< 1	< 1	NA	NA	
30-Mar	EFF033098	< 0.5	< 1	< 1	< 1	< 1	130	37.0	
7-Apr	EFF040798	< 0.5	< 1	< 1	< 1	< 1	97	<10	
8-Apr	EFF040798	< 0.5	< 1	< 1	< 1	< 1	73	<10	
14-Apr	EFF041498	< 0.5	< 1	< 1	< 1	< 1	<60	25.1	
15-Apr	EFF041598	< 0.5	< 1	< 1	< 1	< 1	<60	<10	
20-Apr	EFF042098	< 0.5	< 1	< 1	< 1	< 1	<60	67.5	
27-Apr	EFF042798	< 0.5	< 1	< 1	< 1	< 1	<60	<10	
4-May	EFF050498	< 0.5	< 1	< 1	< 1	< 1	<60	18.5	
11-May	EFF051198	< 0.5	< 1	< 1	< 1	< 1	<60	<10	
18-May	EFF051898	< 0.5	< 1	< 1	< 1	< 1	<60	17.6	
4-Jun	EFF060498	< 0.5	< 1	< 1	< 1	< 1	<60	11.1	
8-Jun	EFF060898	< 0.5	< 1	< 1	< 1	< 1	<60	14.0	
15-Jun	EFF061598	< 0.5	< 1	< 1	< 1	< 1	<60	17.0	
22-Jun	EFF062298	< 0.5	< 1	< 1	< 1	< 1	<60	99.7	
29-Jun	EFF062998	< 0.5	< 1	< 1	< 1	< 1	75.3	14.1	
6-Jul	EFF070698	< 0.5	< 1	< 1	< 1	< 1	<60	18.6	
13-Jul	EFF071398	< 0.5	< 1	< 1	< 1	< 1	<60	11.1	
20-Jul	EFF072098	< 0.5	< 1	< 1	< 1	< 1	143	20.6	
27-Jul	EFF072798	< 0.5	< 1	< 1	< 1	< 1	245	<10	
3-Aug	EFF080398	< 0.5	< 1	< 1	< 1	< 1	<60	20.2	
9-Aug	EFF080998	< 0.5	< 1	< 1	< 1	< 1	<60	22.3	
17-Aug	EFF081798	< 0.5	< 1	< 1	< 1	< 1	115	<10	
24-Aug	EFF082498	< 0.5	< 1	< 1	< 1	< 1	92.2	<10	
31-Aug	EFF083198	< 0.5	< 1	< 1	< 1	< 1	263	<10	
9-Sep	EFF090998	< 0.5	< 1	< 1	< 1	< 1	706	<10	
14-Sep	EFF091498	< 0.5	< 1	< 1	< 1	< 1	100	<10	
21-Sep	EFF092198	< 0.5	< 1	< 1	< 1	< 1	<60	<10	
28-Sep	EFF092898	< 0.5	< 1	< 1	< 1	< 1	<60	<10	
8-Oct	EFF100898	< 0.5	< 1	< 1	< 1	< 1	61.3	11.0	
TAMS Consultants, Inc.									
21-Nov	EFF112198	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	24.5	7.9	

* Re-analysis

Table - 5 Alarm/Response Log

ARMONK PRIVATE WELLS SITE

SITE NO. 3-60-005

Alarm Date	Alarm Conditions	Cause of Alarm	Response Date	Response	System Online Date
4/17/98	Bag Pressure	Sediment Accumulation	4/20/98	Changed bag filter	4/20/98
4/20/98	RW3 Low Level	Unknown	4/20/98	Remote Reset	4/20/98
4/21/98	Bag Pressure	Sediment Accumulation	4/21/98	Changed bag filter	4/21/98
4/22/98	Bag Pressure	Sediment Accumulation	4/22/98	Changed bag filter	4/22/98
4/29/98	Bag Pressure	Sediment Accumulation	4/30/98	Changed bag filter	4/30/98
5/1/98	Effluent high	Unknown	5/1/98	Remote Reset-adjusted level sensors in Eff tank on 5/6/98.	5/1/98
5/5/98	Bag Pressure	Sediment Accumulation	5/6/98	Changed bag filter	5/6/98
5/15/98	Effluent high	Unknown	5/18/98	Reset system	5/18/98
5/20/98	AC Failure	Power outage	5/26/98	Remote reset	5/26/98
6/1/98	AC Failure	Power outage/surge	6/3/98	Reset/Reprogram and repairs.	6/3/98
6/4/98	Bag Pressure	Sediment Accumulation	6/4/98	Changed bag filter	6/4/98
6/8/98	Bag Pressure	Sediment Accumulation	6/8/98	Changed bag filter	6/8/98
6/12/98	Bag Pressure	Sediment Accumulation	6/15/98	Changed bag filter	6/15/98
6/26/96	Bag Pressure	Sediment Accumulation	6/29/98	Changed bag filter	6/29/98
7/3/98	Apparent AC Failure	Power outage/surge	7/6/98	Reset internal breaker	7/6/98
8/6/98	Bag Pressure	Sediment Accumulation	8/6/98	Changed bag filter	7/6/98
9/11/98	Bag Pressure	Sediment Accumulation	9/14/98	Changed bag filter	9/14/98
9/25/98	Bag Pressure	Sediment Accumulation	9/25/98	Changed bag filter	9/25/98

Table - 6 Operation and Maintenance Log

ARMONK PRIVATE WELLS SITE
 SITE NO. 3-60-005

This log is to serve as a operation and maintenance log. Thus, if repairs or maintenance activity of any kind is done to the system, the details of the maintenance activity are to be recorded on this log.

Date	Maintenance Requiring Condition	Maintenance Action Conducted	Estimated time spent conducting work
5/5/98	Sediment accumulation Bag filters #1 and 2.	Changed bag filters.	0.5 hrs
5/11/98	Sediment accumulation BF #1 and 2.	Change bag filters	0.5 hrs
5/11/98	Leaking pressure relief valves 1, 2 and 3 and blowout valve 2.	Repaired all leaks at relief and blowout valves.	2 hrs
5/11/98	Bag filter assembly modification.	Added quick connects and hose to bag filter drains.	2 hrs
5/26/98	Leaking backwash valves.	Replaced backwash valves with plugs.	1 hr
5/26/98	Pre-bag filter pressure at 12.5 psi.	Changed bag filters, 1 and 2.	0.5 hrs
6/1/98	Low level EW-1, 2 and 3.	Investigate system, possible electrical storm damage.	0.5 hrs
6/3/98	System shutdown-all level and pressure sensors.	Re-programmed PLC and meters, replaced damaged electrical components. Some sensors may still malfunction if permanently damaged.	3 hrs
6/8/98	Bag filter pressure.	Changed bag filters 1 and 2.	0.5 hrs
6/15/98	Bag filter pressure alarm on 6/12/98.	Changed bag filters 1 and 2.	0.5 hrs
6/29/98	Bag filter pressure alarm on 6/26/98.	Changed bag filters 1 and 2.	0.5 hrs
6/29/98	Desiccant spent on water level transducers. Sensor malfunction EW-1 & 3.	Changed dessicant and cleaned sensors on EW-1 and EW-3.	3 hrs
7/6/98	RW-3 not pumping. RW-2 low flow.	Reset internal breaker for EW-3 and well pumps.	0.5 hrs
8/6/98	Bag pressure	Changed bag filter	2 hours
8/17/98	EW-2 Flow meter	Re-zeroed flow sensor	3 hours
9/15/98	Bag filter	Changed bag filter 1 and 2.	1 hour

Table 7 - Breakdown of Final Contract Price
ARMONK PRIVATE WELLS SITE
 Site No. 3-60-005

Bid Item No.	Description	Est. Quantity	Unit Quantity	Unit Price	Total	
1	Site Preparation	1	LS	\$80,000.00	\$80,000.00	
2	Site Services	98	DAYS	\$316.00	\$30,968.00	
3	Health & Safety	70	DAYS	\$143.00	\$10,010.00	
4	Modification to Existing Wells	1	LS	\$10,000.00	\$10,000.00	
5	Modification to New Wells	1	LS	\$56,000.00	\$56,000.00	
6	Concrete Manholes	1	LS	\$5,000.00	\$5,000.00	
7a	2" Dia PVC	710	LF	\$1.20	\$852.00	
7b	3" Dia PVC	725	LF	\$2.52	\$1,827.00	
8	2" Copper pipe	290	LF	\$1.87	\$542.30	
9	Building	1	LS	\$50,000.00	\$50,000.00	
10	Facility	1	LS	\$117,245.14	\$117,245.14	
11	System Start up	1	LS	\$11,000.00	\$11,000.00	
12	O&M	6	MTHS	\$6,000.00	\$36,000.00	
13	Outfall	1	LS	\$10,000.00	\$10,000.00	
14	Electrical	1	LS	\$25,000.00	\$25,000.00	
	Subtotal					\$444,444.44

CHANGE ORDERS

Change Order No. 1

A	Proposed Change Order No. 1	1	LS	\$10,140.01	\$10,140.01	
B	Proposed Change Order No. 2	1	LS	\$5,234.27	\$5,234.27	
C	Proposed Change Order No. 3	1	LS	\$7,640.89	\$7,640.89	
D	Proposed Change Order No. 4	1	LS	\$13,980.31	\$13,980.31	
E	Electrical Manhole	1	LS	\$1,170.76	\$1,170.76	
F	Inc. in Bid Item No. 2; Site Services	15	Days	\$316.00	\$4,740.00	
G	Inc. in Bid Item No. 3; Health & Safety	15	Days	\$143.00	\$2,145.00	
H	Adj. to Bid Item No. 1; Site Preparation	1	LS	(\$2,500.00)	(\$2,500.00)	
I	Dec. in Bid Item No. 7b; 3" Dia. PVC	331	LF	(\$2.52)	(\$834.12)	
J	Adj. to Bid Item No. 13: Outfall Structure	1	LS	(\$10,000.00)	(\$10,000.00)	
K	Time Extension	1	LS	(\$27,750.00)	(\$27,750.00)	
	Total Change Order No. 1					\$3,967.12

FINAL CONTRACT PRICE

\$448,411.56

Appendix A

Photographic Documentation



Above: Treatment Building Foundation Excavation.

Below: Site Clearing.





Above: Conduit Installation Along Bedford Road.

Below: EW-1 Vault Installation.





Above: Overview of Site During Construction Activities.

Below: Form Setup for Treatment Building Footer Wall.





Above: Water Connection from Water Main to Manhole.

Below: Treatment Building Construction.





Installation of Electrical and Control Wiring,
Pump and Sensor at EW-3.



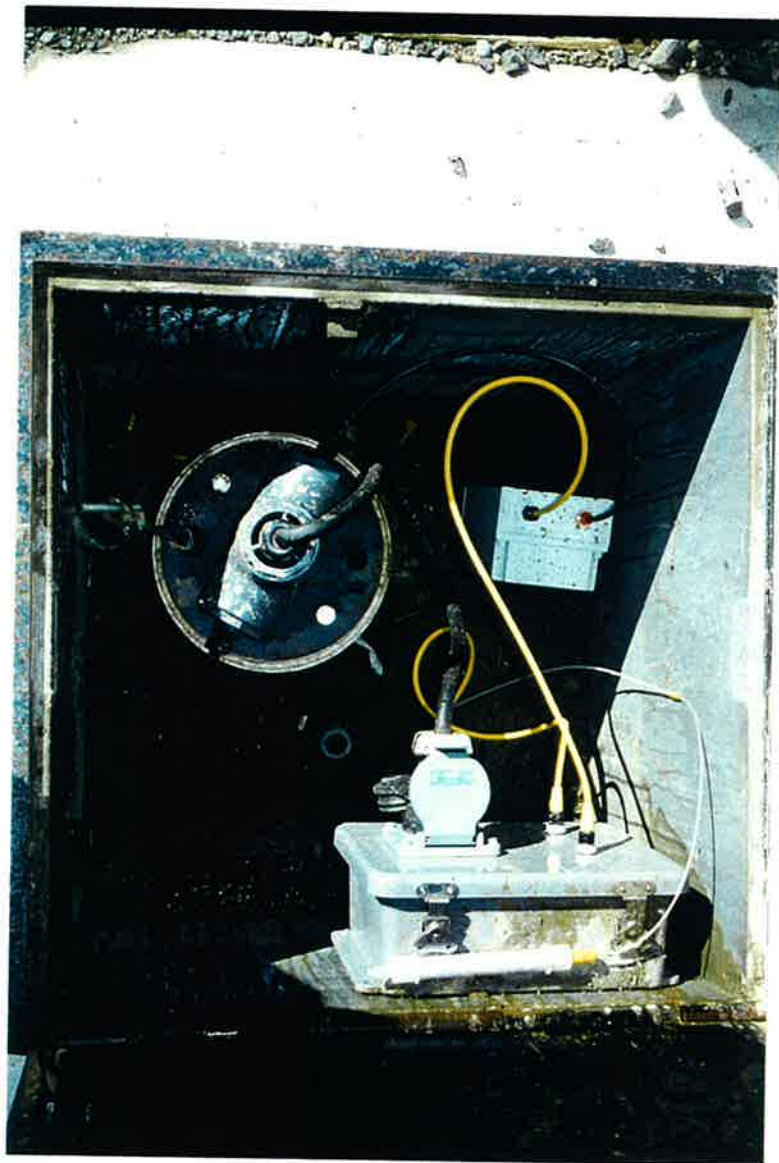
AW-13 Well Abandonment



Internal Piping, Supports, Bag Filters
and Carbon Units.



New Bag Filter (left) and Used Bag Filter (right)



Typical Extraction Well Vault Showing
Power and Control Box Wires,
Transducer Box and Dessicant Tube.



EW-1, EW-2, EW-3 piping at West Wall.



Above: Site at Final Inspection.

Appendix B

Health & Safety Air Monitoring Results

Safety Logs : 10/9/97 – 12/4/97

**Armonk Private Wells Site
NYSDEC Contract # D003635**

Armonk Private Wells Site

Contract No. D00 3635

NYSDEC Site No. 30-60-005

Westchester County, New York

Daily Work Report and Safety Log

Date: 10/9/97

CONTENTS		
PAGE NO.	REFERENCE	DATE

10/9/97
 Arrive on site 0700
 Weather Foggy
 Personnel - TM, BL, JB
 TAMS on site 0800
 Start on excavation
 for foundation
 Level 2
 Initial Background Air
 Monitoring JD
 - Certified payrolls to make
 sure prevailing wages
 - Sub needs prevailing wage
 schedule
 P V 57
 needed for release of
 retainage
 Driller
 Security
 Foundation
 Plumber
 Owner exempt
 still has to
 sign

Armonk Private Wells Site

Contract No. D00 3635

NYSDEC Site No. 30-60-005

Westchester County, New York

Daily Work Report and Safety Log

Date: 10/9/97, 10/8/97

Pages 39-55 - Changes in
work.
Section 2200 to Foundation
Contractor - Testing for
compaction and Sand
cone Testing

- Finish Floor Elevation 3'79.5'
- and Bench Mark

Need Soil Testing Company

Jump dimension between 3' and 3'10"
width between 3' and 2'6"
Calibrated P/Pmeter to 100ppm

Background

11:15 PID 0 ppm

Snapshot Reading Taken

1st downwind at 10:30

TCE = 40.5 ppm

PCB = 2.0 ppm

up wind

2nd downwind at 11:30

TCE = 40.5 ppm

PCB = 2.0 ppm

DWD

Diversified Waste Removal

914) 225-0505

(203) 778-6347

Valley Castings Corp.

Tony - 300 COP COP

Concrete and Asphalt
only.

Mr Holmes on site - one
of the owners.

- requested that we
Finish at west end
of site before holiday

- commented on fill quality

12:15 3rd Downwind Reading on
snapshot

TCE = 40.5 ppm

PCB = 2.0 ppm

Highest Reading on MiniRAM
= 0.10

Note: Previous Day Not entered: 10/8/97

Personnel: MS TM - Site Clearing

Level D + Hard Hats - No Accidents

Armonk Private Wells Site

Contract No. D00 3635

NYSDEC Site No. 30-60-005

Westchester County, New York

Daily Work Report and Safety Log

Date: 10/10, 10/13

Date	Time	Activity
10/10/97	0630	Arrive on site
		- Excavating Foundations
		- Personnel: JB, JM
		TAMS personnel: Akbar + John Egan
		John phone # (201) 682-0656
		Calibrated PID Meter
	08:30	100ppm Forbottle
		Collected reading - 0 ppm
		ground excavation
		Dust levels 0-12
		Protection Level D
		27 yd. #35
10/13/97		Arrive on site
		Personnel: TM, JB, JB, BK
		MS, BC
		Work Done: EW-3
		well, B System down all night
		TAMS personnel: AK, JW
		Ziegler, Fuss, Rinsis, JJ, Jones, BD + Mark
		Matt - Calibrated PID 100ppm
		Look for lead
		Snapshot
		Trichloro ethylene 201 ppm
		Trichloro eth 5.9 ppm
	9:30	Backyard readings:
		Dust: 0.1 mg/ft ³
		Sound with dig: 76 x dB
		76 x dB
	11:00	start drilling
		Snapshot Reading
	11:30	67 wind TCE NI
		PCE NI
	1:15	ground level drilling running 80 dB
		See other book for work area
		monitoring Level D protection
		Security on site 8:00 off site at 5:00

Armonk Private Wells Site

Contract No. D00 3635

NYSDEC Site No. 30-60-005

Westchester County, New York

Daily Work Report and Safety Log

Date: 10/14, 10/15

10/14/97

Arrive on site 0700
Security leaving 0700
Personnel: TM, DK, MS, RG, JB
TAMS: AK, BR
Subs: Ziegenfuss (CTE) Drillers
Muck + Bo
Weather: Foggy/Sun - 50's

10/15/97

Arrive on site 0700
MS, DK, TM, RG, JB
TAMS: Akbar, onsite 0700
Drillers: Ziegenfuss (CTE) Muck + Bo
Raining, 65°
Level D protection
Safety Air Monitor

Time	PID	Min. 0.04
0815	0.0	0.20
0930	0.0	0.48
1015	0.0	1.50
1030	0.0	0.29
1115	0.0	0.37
1150	0.0	0.22

Work Area monitoring recorded in Site book
Level D Protection
OFF Site 1645

OFF Site 1645

Armonk Private Wells Site

Contract No. D00 3635

NYSDEC Site No. 30-60-005

Westchester County, New York

Daily Work Report and Safety Log

Date: 10/16, 10/17

10/16/97			10/17/97		
Armonk Private Wells Armonk, NY			Armonk Private Wells Armonk, NY		
Arrived on site 0700			Arrived on site 0740		
MS, TM, DK, BB, JB			MS, DK, JB, BB		
Overcast 60°			TAMS - Alabar onsite		
TAMS - Alabar on site upon arrival.			Drillers - Ziegenfuss - Mark on site		
Level D Protection			CT&E - Nick onsite		
Safety Air Monitoring			Sunny 45°		
PID (MS)			Level D Protection		
0850			PbC - Snapshot Air Monitoring		
Time	PID	Min:Sec	Upwind	PCE/TCE =	
0810	0.0	0.30		<2.0 / <5.0	8:35
0850	0.0	0.38	Downwind #1	PCE/TCE =	8:45
No more Drilling activity on 10/16/97				<2.0 / <5.0	9:05
OFF Site 1700 MS, DK, TM, BB, JB			Downwind #2	PCE/TCE =	
			Safety Monitoring (Air)		
Time	PID	Min:Sec	Time	PID	Min:Sec
1000	0.0	0.41	1431	0.0	48.4
1030	0.0	0.12	1438	0.0	5.29
1130	0.0	0.49	1509	0.0	0.60
1150	0.0	0.22			
1310	0.0	0.35			
1330	0.0	0.64			
1405	0.0	2.92			
1430	0.0	7.01			
			OFF Site 1700 MS, DK.		

Armonk Private Wells Site

Contract No. D00 3635

NYSDEC Site No. 30-60-005

Westchester County, New York

Daily Work Report and Safety Log

Date: 10/20, 10/21

Armonk Private Wells Armonk, NY			Armonk Private Wells Armonk, NY		
10/20/97			10/21/97		
Arrived on-site 0700			Arrived on-site 0630		
MS, DK, TM, TB, JB, BB			MS, DK, TM, TB, BB, JB		
TAMS - Albur on site			TAMS - Albur on site		
Drillers - Ziegenfuss on site Mark r80			Drillers - Ziegenfuss on site Mark r80		
Level D Protection			Level D Protection		
Safety Air Monitoring			Safety Air Monitoring		
Time	PID	Miniran	Time	PID	Miniran
0820	0.0	0.49	0825	0.0	0.49
0835	0.0	0.43	0910	0.0	0.57
0845	0.0	0.62	1030	0.0	0.00
0900	0.0	4.39	1115	0.0	0.42
0910	0.0	0.0	1130	0.0	0.21
0920	0.0	1.22	1430	0.0	0.31
0925	0.0	1.49	1415	0.0	0.00
0935	0.0	1.32	1445	0.0	0.00
1005	0.0	4.29			
1050	0.0	1.29			
1145	0.0	1.45			
1230	0.0	0.42			
1755	0.0	0.38			
OFF Site	1600	MS, DK, TM, JB, TB, BB	OFF Site	1600	MS, DK

Armonk Private Wells Site

Contract No. D00 3635

NYSDEC Site No. 30-60-005

Westchester County, New York

Daily Work Report and Safety Log

Date: 10/22, 10/23

10/22/97	Armonk Private wells Armonk, NY		
	Arrived onsite 0700		
	Weather Clear Cold - Frost		TB
	Personnel onsite: RT: JB, Lita, Bi-Jim		
	TAMS - Akbar		
	CTE Bill		
	Zones: Major B		
	Level D Protection		
0715	PID Calibration to 100 ppm / sensitivity		
	Snapshot Calibration 10/21/97		
	Triller 209		
	TCB 201		
	Work Trenching Inherent		
	Well Completion		
	Documentation Monitoring: Work area		
	Upwind: RE ND < 2.0 ppm		
	TCB ND < 5.0 ppm		
9:00	Downwind 1: RE < 2.0 ppm		
	TCB < 5.0 ppm		
9:30	2nd Downwind readings		
	collected from bet Downwind of		
	EW-1 and intrusive activity at		
	EW-2. < 2.0, < 5.0 ppm		
	Breathing zone PID drilling ND		
10/23/97	APWS		
	Onsite: 0700 TM, JB, BOK		
	TAMS: Akbar		
	Weather: Cold, Clear Frost		
	Work: Beckfill electrical		
	supply line		
	Trenching TM H&S Officer		
0730	Catibate PID to 100 ppm		
	is about 7.5		
	Upwind readings 0 ppm		
	Downwind readings 0 ppm		
	working in Trench area		
	around EW-1		
	All personnel off-site 3:30 pm		
	Level D Protection		

Armonk Private Wells Site

Contract No. D00 3635

NYSDEC Site No. 30-60-005

Westchester County, New York

Daily Work Report and Safety Log

Date: 10/24, 10/27

Date	Activity
10/24/97	ET Personnel onsite: DK, TB, JB, W, MS, BC TAMS Albar Grading + Compaction for Foundation Footings. Fairway Testing on site for Compaction Testing Level D protection
Monday, 10/27/97	Weather: Rain Personnel: TM Subs: C.G. Electric Level D protection + Hard Hats No intrusive Activities.

Armonk Private Wells Site

Contract No. D00 3635

NYSDEC Site No. 30-60-005

Westchester County, New York

Daily Work Report and Safety Log

Date: 10/28, 10/29

Tuesday	10/28/07	Wed.	10/29/07
TJ, BG, DK, JB ~ 6:30		Onsite - TJ, JB, DK, TM, BC	
MG, JM on site ~ 10:00		Work: Backfilling Trenches	
NYSDEC Dan Evans on site		Installing Electrical	
TAMS - Akbar + John Ryan - PM.		Hand Held boxes	
Thiagarajan.		Electrical Conduit	
Work - Pressure Testing water supply		No reports of Accidents	
line, backfilling water		No vapors detected	
line		No new areas of trenching.	
No Accidents reported		Level D protection + Hard Hats.	
Mini ram test meter on site - No dust ground w/it			
PID meter on site - calibrated to 100ppm			
no vapors detected			
Level D protection			

Armonk Private Wells Site

Contract No. D00 3635

NYSDEC Site No. 30-60-005

Westchester County, New York

Daily Work Report and Safety Log

Date: 10/30, 10/31

Thursday 10/29/30/97

Weather: Clear, warming

Onsite 0630

RT: JM, JB, BG, JB, TB

TIAMS: Akbar

Global Atlas - Foundation Contractor

No new areas trenched or excavated

No vapors detected with PID

PID reading collected

in area around water

main tap - <0.0 ppm

Level D protection + Hard Hat

Friday 10/31/97

Weather: Clear, cloudy, 55°

Onsite: 7:30

FT: OK, MS

TIAMS: Akbar

GA - Foundation Contractor

No new areas trenched or

excavated. No vapors detected

w/ PID meter

PID meter reading collected

while developing EW-3, no vapors

detected, 11:30am

Level D protection

Armonk Private Wells Site

Contract No. D00 3635

NYSDEC Site No. 30-60-005

Westchester County, New York

Daily Work Report and Safety Log

Date: 11/3, 11/4, 11/5

Monday 11/3/97

Weather Clear - warming to 60°F

Onsite: TB, JB, BC, DK TM

TAWS: JE

Globe Atlas on site breaking footing forms and setting up formwork walls - Level D

Tuesday 11/4/97

Cloudy Rainy 60°

Onsite TB, JB

TAWS JE

Glue coating remaining forms

Finished prep for 2 Guys

Double the work - D protection

+ Hard Hats + Safety Vests

Wednesday 11/5/97

Flat Tire on Back Tire

11/5/97 cont.

Completed level sensor buckling

and seeding

No accidents reported.

No intrusive work done

today. No vapors detected

Level D protection

+ Hard Hats + Safety Vests

Armonk Private Wells Site

Contract No. D00 3635

NYSDEC Site No. 30-60-005

Westchester County, New York

Daily Work Report and Safety Log

Date: 11/6, 11/10

11/6/97 Thursday
Arrive on site 0730

Weather Clear Warm

ET: JB, BC, TM

TAMS: Akbar

Reduced specs on work stop

for foundation

1:30pm County Asphalt Trustfall's
stop + measure Road to

Asphalt paving estimate

work - BC - Extension electrical

sketch at work. Located

area lower behind historic site

on east side of site.

JB moving brush and samples

to dumpster

paving solid debris in

pits on site per NYSDEC

(direction)

At: dust or vapors needed.

Level D + Hard hats + Safety

Vests

11/10/97 Monday
Onsite 0700

Weather Clear cold

ET: JB, BC, TM, TB

TAMS: John Eggen

Work: Install pitless

and well boxes.

Approved change by TAMS

Dumpster (DWB) called

to remove 20yd dumpster

to fill w/ brush.

Backhoe blew another hose

this morning while JB attempted

to bury remaining concrete.

No reported Accidents

Level D protection

Armonk Private Wells Site

Contract No. D00 3635

NYSDEC Site No. 30-60-005

Westchester County, New York

Daily Work Report and Safety Log

Date: 11/11, 11/12, 11/13, 11/18, 11/19, ^{11/20,} 11/21, 11/24, 11/25

11/11/97 Tuesday

JB, TB, DC, TM

No reported Accidents

Level D protection

11/12/97 Wednesday

No reported Accidents

Level D protection

11/13/97

Level D protection

No reported accidents

11/18/97

Level D protection

Backfilling Foundation

- TM cut left thumb

with Sawzall - First

aid applied

No other reported accidents

11/19/97

Level D protection

No reported Accidents

11/20/97

Level D protection

Backfilling foundation

No reported accidents

11/21/97

Level D protection

JB spreading gravel

on dentist parking lot

No reported Accidents

11/24/97

No E.T. personnel

on site.

Global on site

backfilling foundation

with gravel

No accidents reported

Level D protection

11/25/97

No E.T. personnel initially on site

Armonk Private Wells Site

Contract No. D00 3635

NYSDEC Site No. 30-60-005

Westchester County, New York

~~Daily Work Report~~ and Safety Log

Date: 11/26, 12/4

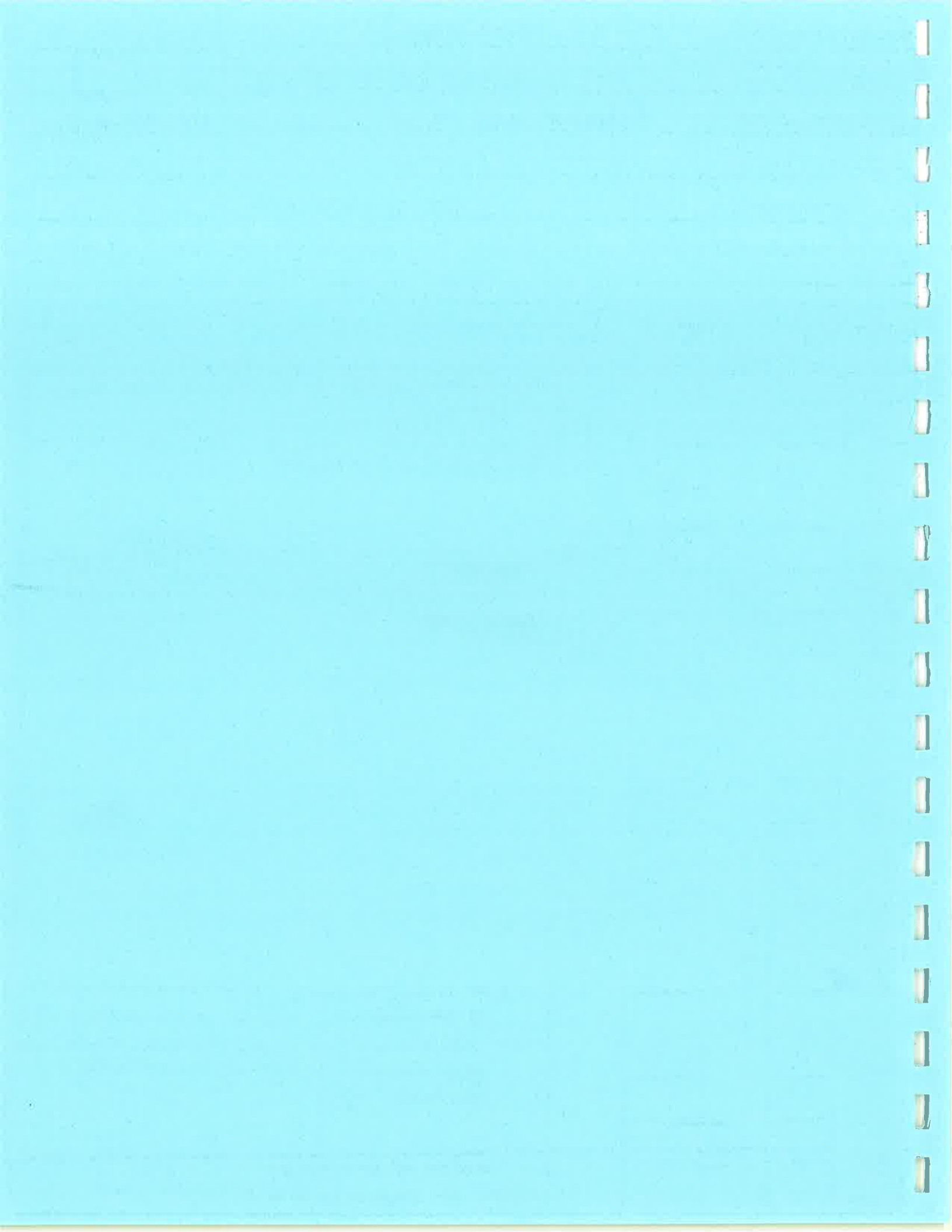
Global on-site
welding cage (reinforcement)
for slab.
BG + DK on site installin
Electric Conduit under with curly
reinforcing rods in slab and
installing sleeves for piping
Level D protection
No Reported Accidents
11/26/97

RT: JB on site
Level D protection
No Reported Accidents.

Thursday 12/4/97
EIT personnel: TM, MO
IAMS: MT, JE
NYSDEC: Don Evans
Weather: Clearing, Mild
work-site inspection - meeting
No reported accidents.

Appendix C

Boring Logs

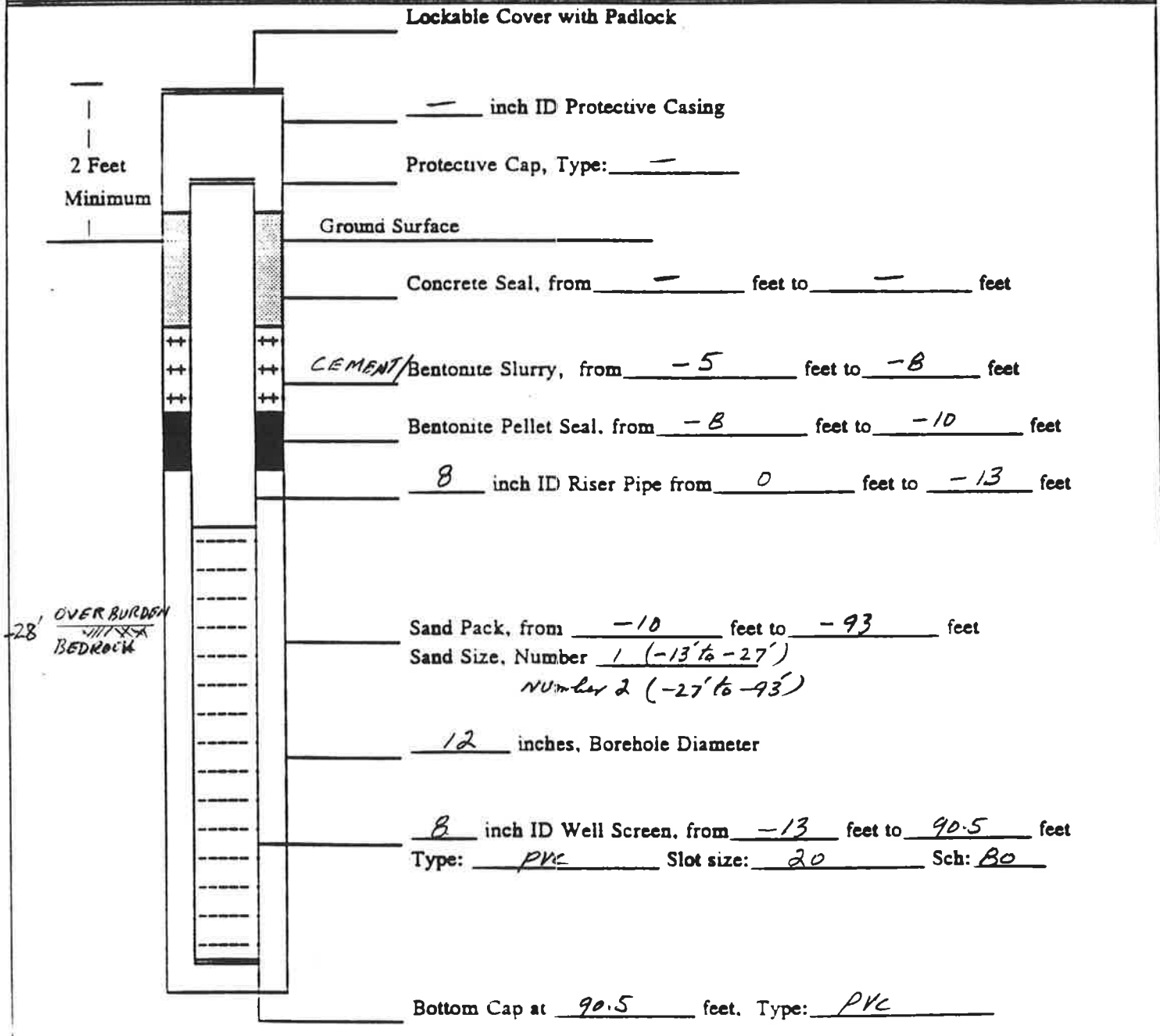


PROJECT <i>ARMONK PRIVATE WELLS</i>	CONTRACTOR <i>ZIEGFENFUSS DRILLING CORP</i>	PAGE 1 OF 2
PROJECT NO. <i>5959</i>	LOCATION <i>ARMONK, NY</i>	DATE <i>10/17-22/97</i>
SURFACE ELEVATION	DATUM	DRILLER <i>J. SMOZZO</i>
		TAMS REP. <i>M. ARBAR</i>

WATER LEVELS				DRILLING AND SAMPLING			
DATE	TIME	DEPTH	CASING	CASING	SAMPLER	CORE	TUBE
				TYPE	<i>STEEL</i>	<i>DOWN-THE-HOLE-HAMMER</i>	
				I.D.	<i>12"</i>	<i>1 1/8"</i>	
				WT/Fail			

Depth (ft)	Casing Blows	Sample Number	Blows per/6"	Recovery (Inches)	SAMPLE DESCRIPTION, REMARKS, AND STRATUM CHANGES
-5					<i>Brown Coarse to fine SAND, some silt, trace to some gravel.</i>
-10					
-15					<i>Brown SILT and fine SAND.</i>
-20					
-25					<i>Dark gray-black Coarse to fine SAND, some gravel (Weathered rock)</i> <i>TOP of Rock = 28'</i>
-30					<i>GNEISS</i>
-35					
-40					
-45					
-50					
-55					
-60					
-65					
-70					
-75					
-80					<i>(No sampling or coring was performed. Identification of the material is based on the drill-cuttings which came out of the hole during down-the-hole-hammer drilling by dual rotary "BARBER" rig)</i>
-85					
-90					
-95					
100					<i>Bottom of Boring = 93'</i> <i>NOTE: See page 2 for well installation details.</i>

Project <i>ARMONK PRIVATE WELLS</i>	Location <i>ARMONK, NY</i>	Page 2 of 2		
Project No. <i>5959</i>	Contractor <i>ZIEGENFUSS DRILLING CORPORATION</i>	Water Levels		
Surface Elevation	Driller <i>J. SMOZZO</i>	Date	Time	Depth
Top of Riser Elevation	Well Permit Number	<i>10/24/97</i>	<i>0730</i>	<i>16.0'</i>
	TAMS Rep. <i>M. ARBAO</i>			
Datum	Date of Completion <i>10/22/97</i>			



Note: All measurements based on ground surface at 0 feet, (+) above grade, (-) below grade.

(NOT TO SCALE)

PROJECT: ARMONK PRIVATE WELL	CONTRACTOR: AMERICAN AUGER & DITCHING	PAGE 1 OF 10
PROJECT NO.: 5651-133	LOCATION: ARMONK, NY	DATE: 4/19 - 5/11/94
SURFACE ELEVATION: 380.66	DATUM: NGVD	DRILLER: R.BAYE
		TAMS REP.: D. SCHEUIN

WATER LEVELS				DRILLING AND SAMPLING				
DATE	TIME	DEPTH	CASING		CASING	SAMPLER	CORE	TUBE
5/4/94	10:08	10.50'	WELL	TYPE	Steel FJ	(see note)	NX	-
1/1/94	17:02	10.29'	WELL	I.D.	6 inch	-	2-1/8 in.	-
				WT./Fall	Spun	-	-	-

Depth (ft)	Sample Number	Blows per/6"	Recovery (Inches)	SAMPLE DESCRIPTION, REMARKS, AND STRATUM CHANGES
1				No overburden samples collected.
2				For overburden stratigraphy, refer to boring log AW-12.
3				Borehole from 0 to 51' BG drilled using 9-7/8" tri-cone roller bit, mud rotary technique.
4				
5				Drill cuttings consist of fine to medium Sand, with some biotite.
6				
7				<u>Summary Boring Log AW-12:</u>
8				Medium dense to loose, fine to coarse SAND, little to trace Silt, trace Gravel (bottom 5' dense, some gravel). Water first encountered at 19' bg. Boring AW-12 terminated at 44.5' bg.
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				

PROJECT: ARMONK PRIVATE WELLS

PROJECT NO.: 5651-133

PAGE 2 OF 10

Depth (ft)	Sample Number	Blows per/6"	Recovery (Inches)	SAMPLE DESCRIPTION, REMARKS, AND STRATUM CHANGES
--20		-----		For overburden stratigraphy, refer to boring log AW-12.
--21		-----		
--22		-----		Drill cuttings consist of fine to medium Sand, with some biotite.
--23		-----		
--24		-----		
--25		-----		
--26		-----		
--27		-----		
--28		-----		
--29		-----		
--30		-----		
--31		-----		
--32		-----		
--33		-----		
--34		-----		
--35		-----		
--36		-----		
--37		-----		
--38		-----		
--39		-----		
--40		-----		

PROJECT: ARMONK PRIVATE WELLS

PROJECT NO.: 5651-133

PAGE 3 OF 10

Depth (ft)	Sample Number	Blows per/6"	Recovery (Inches)	SAMPLE DESCRIPTION, REMARKS, AND STRATUM CHANGES
40				For overburden stratigraphy, refer to boring log AW-12.
41				Drill cuttings consist of fine to medium Sand, with some biotite.
42				
43				
44				Hard surface encountered at 44.0', continued drilling with 9-7/8" roller bit; broke through boulder at 45.5'.
45				Bedrock encountered at 46.0' 46.0'
46				-----
47				Drill cuttings consist of biotite gneiss chips (bedrock) with some coarse quartz grains, and shale fragments (overburden).
48				Average drilling rate = 13.75 min/ft.
49				
50				Advance 9-7/8" bedrock socket to 51.0'. Set 6" black steel casing to 51.0' 4/19/94. Begin Nx coring 4/26/94.
51				(Lee Penrod - driller for coring)
52				Dark grey to black, biotite gneiss, moderately fractured.
53	R-1			Run = 50.7' to 55.0' Rec. = 4.3' (top 0.3' = grout plug) RQD = 86%
54				
55				
56				
57	R-2			Dark grey to black, biotite gneiss, moderately fractured.
58				Run = 55.0' to 60.0' Rec. = 4.55' RQD = 46%
59				
60				

PROJECT: ARMONK PRIVATE WELLS

PROJECT NO.: 5651-133

PAGE 4 OF 10

Depth (ft)	Sample Number	Blows per/6"	Recovery (Inches)	SAMPLE DESCRIPTION, REMARKS, AND STRATUM CHANGES
-60				
-61				
-62	R-3			Dark grey to black biotite gneiss, fractured, some quartz rich zones at 62.5' and 63.0'. Run = 60.0' to 65.0' Rec. = 4.55' RQD = 77%
-63				
-64				
-65				
-66				
-67	R-4			Dark grey to black biotite gneiss, fractured, some quartz rich zones between 65.0' and 66.5'. Run = 65.0' to 70.0' Rec. = 5.0' RQD = 90%
-68				
-69				
-70				
-71				
-72	R-5			Dark grey to black biotite gneiss, fractured, large sub-vertical fracture 71' to 74', slightly weathered surfaces. Run = 70.0' to 75.0' Rec. = 5.0' RQD = 96%
-73				
-74				
-75				
-76				
-77	R-6			Dark grey to black biotite gneiss, fractured. Run = 75.0' to 80.0' Rec. = 4.95' RQD = 100%
-78				
-79				
-80				

PROJECT: ARMONK PRIVATE WELLS

PROJECT NO.: 5651-133

PAGE 5 OF 10

Depth (ft)	Sample Number	Blows per/6"	Recovery (Inches)	SAMPLE DESCRIPTION, REMARKS, AND STRATUM CHANGES
-80	R-7			Dark grey to black biotite gneiss, fractured, large sub-vertical fracture 84' to 84.75'. Run = 80.0' to 85.0' Rec. = 5.0' RQD = 90%
-81				
-82				
-83				
-84				
-85	R-8			Dark grey to black biotite gneiss, fractured, quartz rich zone at 82.5'. Run = 85.0' to 90.0' Rec. = 5.0' RQD = 97%
-86				
-87				
-88				
-89				
-90	R-9			(Coring rate = 2.2 ft/min.) Dark grey to black biotite gneiss, fractured, several quartz rich zones. Run = 90.0' to 95.0' Rec. = 5.2' RQD = 100%
-91				
-92				
-93				
-94				
-95	R-10			(Coring rate = 2.0 ft/min.) Dark grey to black biotite gneiss, fractured, several quartz rich zones. Run = 95.0' to 100.0' Rec. = 5.0' RQD = 96%
-96				
-97				
-98				
-99				
-100				

PROJECT: ARMONK PRIVATE WELLS

PROJECT NO.: 5651-133

PAGE 6 OF 10

Depth (ft)	Sample Number	Blows per/6"	Recovery (Inches)	SAMPLE DESCRIPTION, REMARKS, AND STRATUM CHANGES
-100	R-11			Dark grey to black biotite gneiss, fractured, several quartz rich zones. Run = 100.0' to 105.0' Rec. = 4.85' RQD = 95%
-101				
-102				
-103				
-104				
-105	R-12			Dark grey to black biotite gneiss, fractured, significant fractures between 107' and 107.5', and at 109'. Run = 105.0' to 110.0' Rec. = 5.05' RQD = 89%
-106				
-107				
-108				
-109				
-110	R-13			Dark grey to black biotite gneiss, fractured, several quartz rich zones. (Lower section highly fractured, appears to be drilling induced.) Run = 110.0' to 115.0' Rec. = 5.2' RQD = 82% (Finish drilling 4/26/94) (Resume drilling 4/27/94)
-111				
-112				
-113				
-114				
-115	R-14			Dark grey to black biotite gneiss, fractured, several quartz rich zones, garnet along foliation. Run = 115.0' to 120.0' Rec. = 5.1' RQD = 100%
-116				
-117				
-118				
-119				
-120				

PROJECT: ARMONK PRIVATE WELLS

PROJECT NO.: 5651-133

PAGE 7 OF 10

Depth (ft)	Sample Number	Blows per/6"	Recovery (Inches)	SAMPLE DESCRIPTION, REMARKS, AND STRATUM CHANGES
-120	R-15			<p>Dark grey to black biotite gneiss, fractured, several quartz rich zones.</p> <p>Run = 120.0' to 125.0' Rec. = 5.0' RQD = 85%</p>
-121				
-122				
-123				
-124				
-125	R-16			<p>Dark grey to black biotite gneiss, fractured, several quartz rich zones, significant zone between 125' and 127'; interspersed clay, highly weathered.</p> <p>Run = 125.0' to 130.0' Rec. = 5.0' RQD = 58%</p>
-126				
-127				
-128				
-129	R-17			<p>Dark grey to black biotite gneiss, fractured, several quartz rich zones.</p> <p>Run = 130.0' to 135.0' Rec. = 5.0' RQD = 95%</p>
-130				
-131				
-132				
-133				
-134	R-18			<p>Interfingered dark grey to black biotite gneiss and grey quartz biotite gneiss.</p> <p>Run = 135.0' to 140.0' Rec. = 4.9' RQD = 100%</p>
-135				
-136				
-137				
-138				
-139				
-140				

PROJECT: ARMONK PRIVATE WELLS

PROJECT NO.: 5651-133

PAGE 8 OF 10

Depth (ft)	Sample Number	Blows per/6"	Recovery (Inches)	SAMPLE DESCRIPTION, REMARKS, AND STRATUM CHANGES
				(Gradational contact 135' to 140')
140				
141				
142	R-19			Dark grey quartz biotite gneiss, some fractures between 141.5' and 142'.
143				
144				Run = 130.0' to 135.0' Rec. = 5.0' RQD = 95%
145				
146				
147	R-20			Dark grey quartz biotite gneiss, several fractures.
148				
149				Run = 145.0' to 150.0' Rec. = 4.95' RQD = 60%
150				
151				
152	R-21			Dark grey quartz biotite gneiss, several fractures.
153				
154				Run = 150.0' to 155.0' Rec. = 5.0' RQD = 96%
155				
156				
157	R-22			Dark grey quartz biotite gneiss, substantial fracture at 158', weathered surfaces.
158				
159				Run = 155.0' to 160.0' Rec. = 5.0' RQD = 96%
160				

PROJECT: ARMONK PRIVATE WELLS

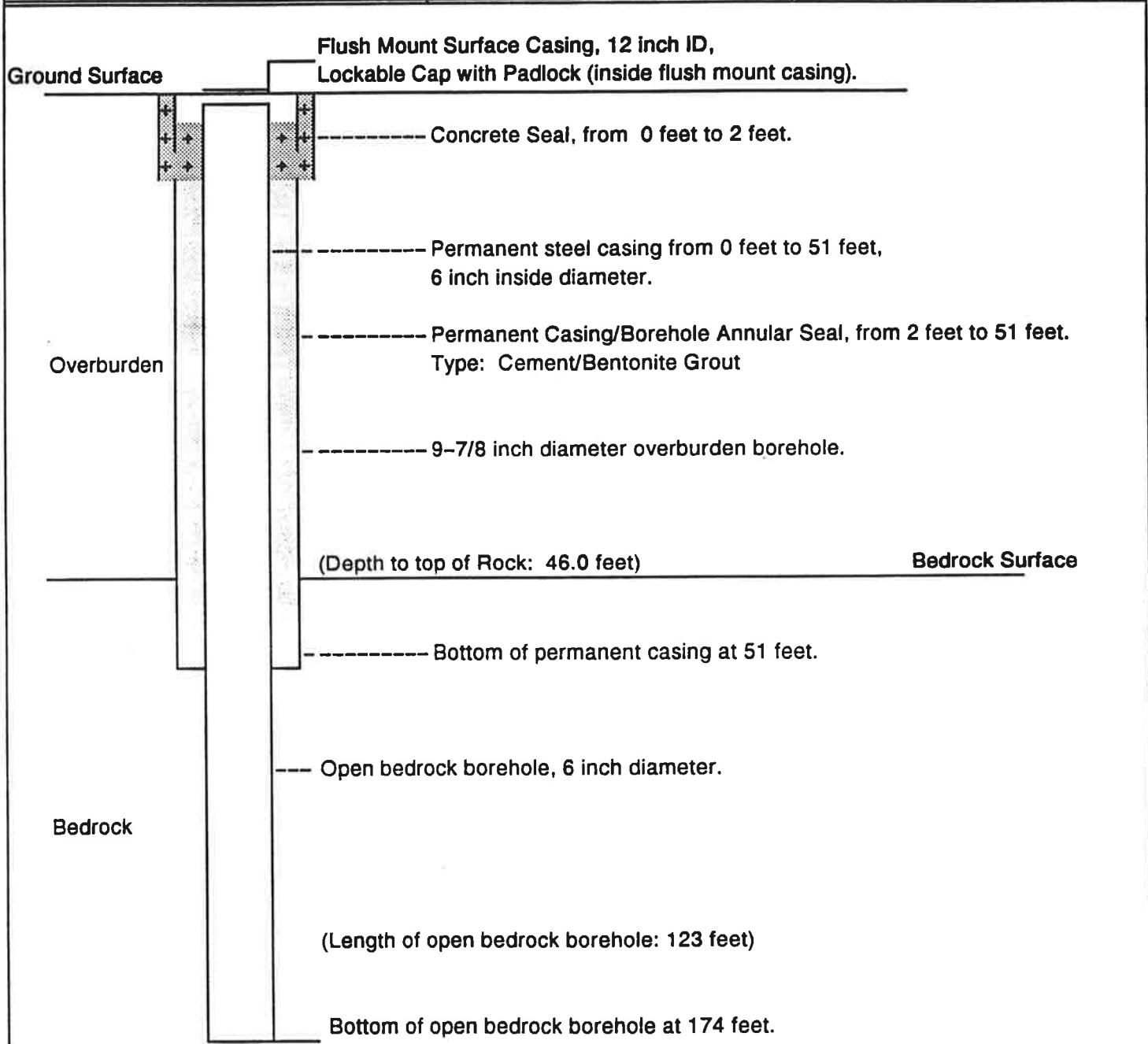
PROJECT NO.: 5651-133

PAGE 9 OF 10

Depth (ft)	Sample Number	Blows per/6"	Recovery (Inches)	SAMPLE DESCRIPTION, REMARKS, AND STRATUM CHANGES
-160	R-23			Dark grey quartz biotite gneiss, several natural fractures. Run = 160.0' to 165.0' Rec. = 5.1' RQD = 97%
-161				
-162				
-163				
-164				
-165	R-24			Highly fractured biotite gneiss, some green mafic minerals (hornblende), weathered, subvertical fracture between 168' and 169'. Run = 165.0' to 170.0' Rec. = 5.0' RQD = 70%
-166				
-167				
-168				
-169				
-170	R-25			Highly fractured biotite gneiss, some green mafic minerals (hornblende), weathered. (High degree of fracturing making drilling difficult, stop 4/27/94.) Run = 170.0' to 174.0' Rec. = 5.0' RQD = 70%
-171				
-172				
-173				
-174				
-175				Boring terminated at 174.0' below grade.
-176				Nx corehole reamed to 6" diameter using air rotary technique, 5/2/94.
-177				Flush mount protective cover and locking cap installed 5/11/94.
-178				Refer to page 10 for well construction details.
-179				
-180				

174.0'

Project: Armonk Private Wells	Location: Armonk, NY	Page 10 of 10		
Project No.: 5651-133	American Auger Contractor: and Ditching	Water Levels		
Surface Elevation: 380.66	Driller: R. Baye	Date	Time	Depth
Top of Casing Elevation: 380.70	Well Permit Number: n/a	5/4/94	10:08	10.50'
		11/1/94	17:02	10.29'
Datum: NGVD	Date of Completion: 5/11/94			



Note: All measurements referenced to feet below grade.

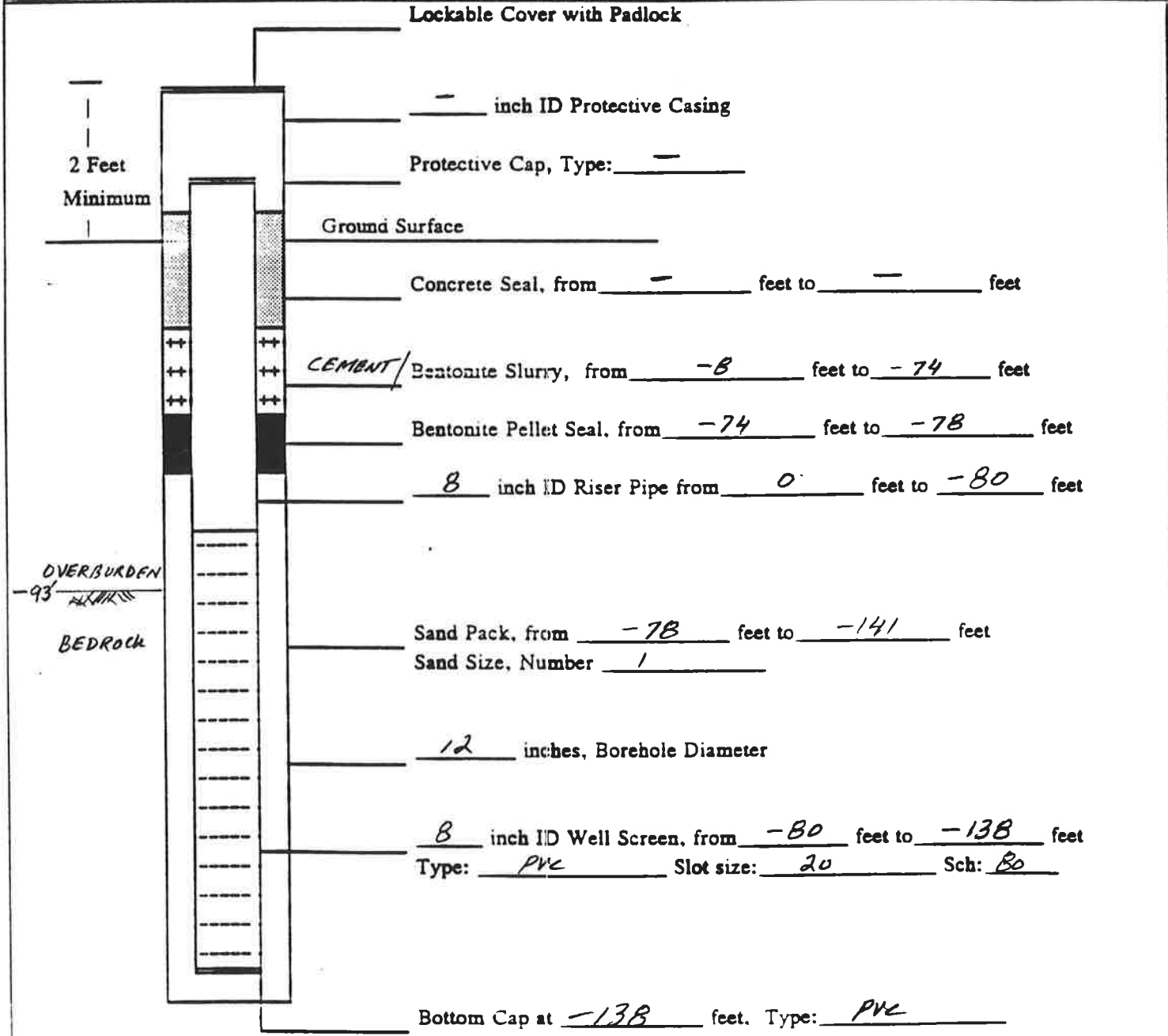
(NOT TO SCALE)

PROJECT	ARMDNK PRIVATE WELLS	CONTRACTOR	ZIEGENFUSS DRILLING CORP.	PAGE	1 OF 3
PROJECT NO.	5959	LOCATION	ARMDNK, NY	DATE	10/13-16/97
SURFACE ELEVATION		DATUM		DRILLER	J. SMOZZO
				TAMS REP.	M. AKBAR

WATER LEVELS				DRILLING AND SAMPLING			
DATE	TIME	DEPTH	CASING	CASING	SAMPLER	CORE	TUBE
				TYPE	STEEL	DOWN-THE-HOLE HAMMER	
				I.D.	12"	1 7/8"	
				WT/Fall			

Depth (ft)	Casing Blows	Sample Number	Blows per/6"	Recovery (Inches)	SAMPLE DESCRIPTION, REMARKS, AND STRATUM CHANGES
-5					Brown and gray coarse to fine SAND, some gravel, some silt.
-10					
-15					
-20					Brown coarse to fine SAND, trace silt.
-25					
-30					
-35					
-40					Brown and gray coarse to fine SAND and SILT.
-45					
-50					
-55					
-60					
-65					
-70					
-75					Gray SILT and fine SAND.
-80					
-85					GRAVEL ZONE
-90					Gray coarse to fine SAND. (Weathered rock)
-95					TOP OF ROCK = 93'
100					GNEISS

Project <i>ARMONK PRIVATE WELLS</i>	Location <i>ARMONK, NY</i>	Page 3 of 3		
Project No. <i>5959</i>	Contractor <i>ZIEGENFUSS DRILLING CORPORATION</i>	Water Levels		
Surface Elevation	Driller <i>J. SMOZZO</i>	Date	Time	Depth
Top of Riser Elevation	Well Permit Number	<i>10/24/97</i>	<i>07:30</i>	<i>10.0'</i>
	TAMS Rep. <i>M. AKBAR</i>			
Datum	Date of Completion <i>10/16/97</i>			



Note: All measurements based on ground surface at 0 feet, (+) above grade. (-) below grade.

(NOT TO SCALE)

Appendix D
Building Permit

BUILDING PERMIT

**TOWN OF NORTH CASTLE
17 BEDFORD ROAD
ARMONK, N.Y. 10504**

Permit No: 10356

**File Date: 10/21/97
Exp. Date: 10/21/99**

SEC-BLK-LOT: 2/14/9.--

Permit Fee: 0.00

ZONED: CB

CO Fee: 0.00

**permit is hereby given by the Building Department, TOWN OF NORTH CASTLE,
COUNTY OF WESTCHESTER, for the structure described herein:**

**Owner's Name: HERITAGE SQUARES
Address: C/O PETER KENNEDY 101 KING STREET CHAPPAQUA NY 10514**

**Architect's Name: TAMS CONSULTANTS, INC.(N.Y.S.D.E.C.)
Address: 300 BROAD ACRES DR. BLOOMFIELD, NJ 07003**

**Builder's Name: ENVIROTRAC(TED MASTERS)
Address: 561 P. ACORN ST. DEER PARK, NY 11729**

**Plumber's Name: TO BE DETERMINED
Address:**

**Electrician's Name: TO BE DETERMINED
Address:**

Location: 44 BEDFORD RD. ARMONK, NY 10504

Number of Stories: 0.0	Number of Families: 0	Number of Rooms: 0
Number of Bedrooms: 0	Number of Bathrooms: 0.0	Sq Ft Living Area: 0.00
Use of Permit: COMM.WATER TREAT.SHED		Sq Ft Total Area: 560.00
Type of Permit: BUILDING	Set Back Front: 10	Set Back Rear: 30
	Set Back Side: 0	Set Back Other Side: 0

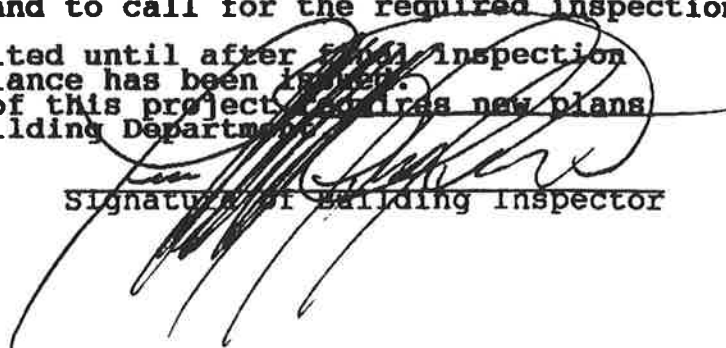
**Description of Construction: GROUND WATER TREATMENT BUILDING(SHED). TEMPORARY
STRUCTURE TO HOUSE CARBON TREATMENT UNITS.**

Approximate Cost: \$\$\$\$\$45,000.00

IMPORTANT

- 1. A permit under which no work has commenced within twelve (12) months after issuance, shall expire by limitation, and a new permit must be secured before work can begin.**
- 2. It is the responsibility of the owner and/or contractor to comply with all applicable Town and State ordinances and to call for the required inspections at least one day in advance.**
- 3. Occupancy of these premises is prohibited until after final inspection and Certificate of Occupancy or Compliance has been issued.**
- 4. Any change in construction or design of this project requires new plans submitted and approved by the Town Building Department.**

Signature of Building Inspector



PERMIT AND CHECK LIST MUST BE DISPLAYED IN WORK AREA

ON SITE CHECK LIST

DATE

_____	FOOTING INSPECTION	_____
_____	SUREVY OF FOUNDATION WALLS	_____
_____	FOOTING DRAIN-WATERPROOFING INSPECTION	_____
_____	FRAMING INSPECTION	_____
_____	INSULATION INSPECTION	_____
_____	FINAL INSPECTION	_____
_____	FIRE PLACE INSPECTION	_____
_____	PLUMBING PERMIT	_____

YOU WILL NEED THE FOLLOWING FOR A CERTIFICATE OF OCCUPANCY

CHECKLIST

_____	BOARD OF HEALTH CERTIFICATE OF COMPLINACE	_____
_____	BOARD OF FIRE UNDERWRITER'S CERTIFICATE	_____
_____	FINAL HIGHWAY DEPARTMENT APPROVAL	_____
_____	FINAL PLUMBING CERTIFICATE	_____
_____	CERTIFIED AS BUILT SURVEY	_____
_____	CERTIFIED AS BUILT SURVEY FOR DRIVEWAY	_____
_____	CERTIFICATE OF OCCUPANCY NO. _____	_____
_____	CERTIFICATE OF COMPLIANCE NO. _____	_____
_____	WELL LOG CERTIFICATE FOR NEW CONSTRUCTION	_____

COMMENTS

Appendix E

Granular Activated Carbon Unit Specifications



MOBILE MODEL 6

MODULAR CARBON ADSORPTION SYSTEM SHIPPED FULLY ASSEMBLED

DESCRIPTION

The Calgon Carbon Mobile Model 6 is an adsorption system designed for the removal of dissolved organic contaminants from liquids using granular activated carbon. The modular design concept allows selection of options or alternate materials to best meet the requirements of the customer's site and treatment application.

The Mobile Model 6 system is delivered as a complete assembly with two adsorbers and compact center piping network, requiring only a single crane lift for field installation. The unit can be shipped prefilled with granular activated carbon. The pre-engineered Mobile Model 6 design assures that all adsorption system functions can be performed with the valves and equipment process design that is shipped to the site.

The process piping valve network for the Mobile Model 6 offers operation of the adsorbers in parallel or series flow (with either adsorber placed in the lead stage). The piping valve network can also isolate either adsorber from the process flow. This permits carbon exchange or backwash operations to be performed on one adsorber without interrupting treatment.

The underdrain design provides for the efficient collection and uniform distribution of treated water and the uniform distribution of backwash water. The Mobile Model 6 system is designed for use with Calgon Carbon's closed loop carbon exchange service. Using specially designed trailers, spent carbon is removed from the adsorbers in a closed loop and returned to Calgon Carbon for reactivation. The transfer is accomplished without exposure of operating personnel to contaminated liquid. The trailers also recharge the adsorbers with fresh activated carbon.

OPERATING CONDITIONS

System flow (at 8 gpm/sq. ft.) ---- 225 gpm (series) 450 gpm (parallel)
 Carbon per adsorber (max. nonbackwashable) --- 6000lbs. (2727 kg)
 Pressure rating: 75 psig (517 kPa)
 Pressure relief: Graphite rupture disk (67 psig)
 Vacuum rating: Full vacuum
 Temperature rating 140°F maximum (65°C)
 Backwash rate: 340 gpm per adsorber (at 12 gpm/sq. ft.)
 Backwash expansion per adsorber with 6000 lbs. carbon 0%
 Backwash expansion per adsorber with 4800 lbs. carbon 25%
 Backwash expansion per adsorber with 4000 lbs carbon 50%
 Carbon transfer: Air pressure slurry transfer
 Utility air (for carbon transfers) 100 scfm at 30 psig
 (reduce to 15 psig for trailer)
 Utility water: (for carbon transfers) 100 gpm at 30 psig
 Freeze protection None provided; enclosure or
 protection recommended.

SYSTEM SPECIFICATIONS

Standard Features:

Carbon adsorbers:

- Carbon steel ASME code stamped pressure vessels.
- Internal vinyl ester lining (Plasite 4006 25 to 35 mils) for potable water and most liquid applications. (Recommended)
- Polypropylene slotted nozzles for water collection and backwash distribution.
- 14" x 18" elliptical manway for internal access.

Standard adsorption system piping:

- 4" schedule 40 carbon steel process piping with cast iron fittings accommodates lead/lag flow.
- Cast iron butterfly valves for process piping.
- 3" carbon line with 4" hose adapter fitting.

System external coating:

- Epoxy mastic paint

Other Standard Features:

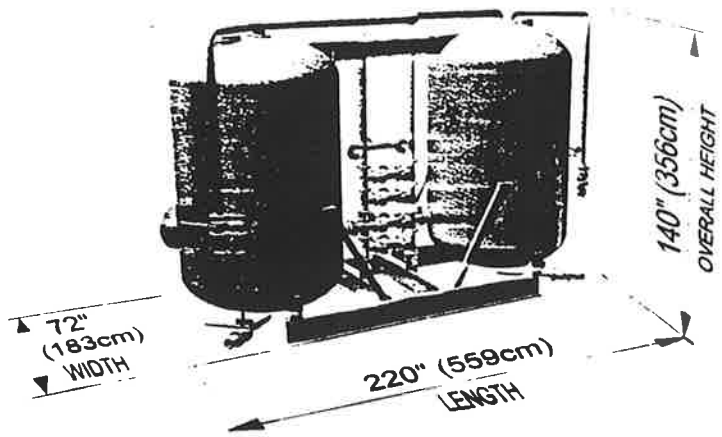
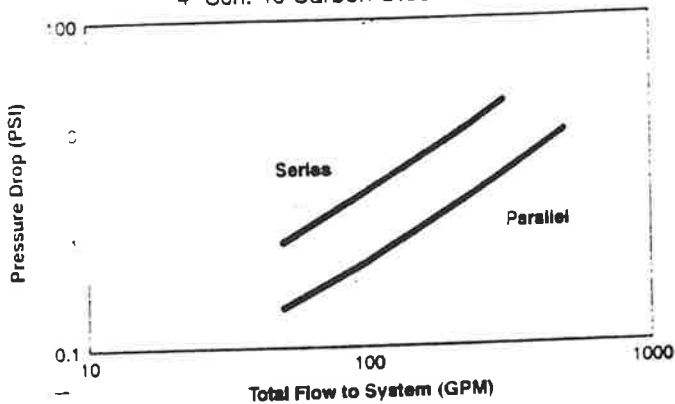
- System platform skid for ease of field installation.
- Stainless steel pipe for carbon discharge.
- Full bore stainless steel ball valves for carbon fill and discharge pipelines
- Two in-bed sample taps for each adsorber.
- Pressure gauges (3). Piping sample taps (3).
- Vessel pressure rating 75 lbs.
- Seismic Zone 4 construction.
- 8" nozzle per adsorber, for dry filling of carbon material.
- Independent backwash source

Available Features:

- Pre-loaded carbon fill
- Differential pressure switches.
- Other lining/painting materials.
- Alternate manway sizes.
- Process pipe sizes and materials of construction with redesign.
- Pressure relief valves.
- Alternate underdrain designs available with redesign.
- Carbon traps.
- Vessel pressure rating -125 lbs.

Mobile 6 Pressure Drop

Filtrisorb 300 Carbon (55°F)
4" Sch. 40 Carbon Steel Pipe



DIMENSIONS AND FIELD CONNECTIONS

Adsorbent vessel diameter:	6ft. (2440 mm)
Process Pipe:	4 in.
Process Pipe connection:	125# ANSI flange
Utility water connection:	3/4 in. hose connection
Utility air connection:	3/4 in. hose connection
Carbon hose connection:	4 in. Kamlock type
Backwash connections:	4 in. flange
Adsorbent maintenance access:	14" x 18" elliptical manway
System shipping weight (empty):	13,900 lbs. (empty) (63 kg)
Shipping weight (with max 12,000 lbs. carbon):	25,900 lbs. (11,773 kg)
System operating weight (with max 12,000 lbs. carbon):	50,500 lbs. (22,955 kg)

SAFETY MESSAGE

Wet activated carbon preferentially removes oxygen from air. In closed or partially closed containers and vessels, oxygen depletion may reach hazardous levels. If workers are to enter a vessel containing carbon, appropriate sampling and work procedures for potentially low oxygen spaces should be followed, including all applicable federal and state requirements.

1-800-4-CARBON

Domestic Sales Offices

Region I

Bridgewater, NJ
Tel (908) 526-4646
Fax (908) 526-2467

Region II

Pittsburgh, PA
Tel (412) 787-6700
1-800-4-CARBON
Fax (412) 787-6676

Region III

Lisle, IL
Tel (708) 505-1919
Fax (708) 505-1936

Region IV

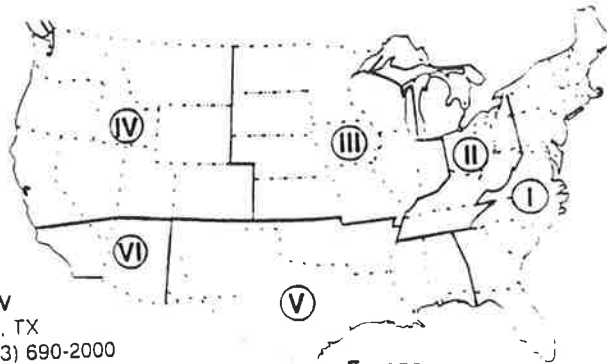
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Fax (713) 690-7909

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Tel 32 2 773 02 11
Fax 32 2 770 93 94

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Fax (905) 673-8883

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Tel (412) 787-4519
Fax (412) 787-4523

Singapore/Asia Pacific

Calgon Carbon Corp.
Tel (65) 221-3500
Fax (65) 221-3554

Calgon Carbon Corporation's activated carbon products are continuously being improved and changes may have taken place since this publication went to press.



CALGON CARBON CORPORATION



FILTRASORB® 300 & 400

GRANULAR ACTIVATED CARBONS FOR WASTEWATER

DESCRIPTION

Filtrisorb 300 and 400 are two grades of granular activated carbon manufactured by Calgon Carbon Corporation for removal of organic pollutants from municipal or industrial wastewaters. These carbons are manufactured from select grades of bituminous coal to produce a high density, high surface area, durable granular product capable of withstanding the abrasion and dynamics associated with repeated reactivation, hydraulic transport, backwashing and mechanical handling.

APPLICATIONS

- Applying point source treatment to remove organics
- Pre-treatment to biological waste treatment systems
- Polishing effluent from biological waste treatment systems
- Recycling the treated water for replacement of groundwater or for other suitable recycling applications
- Providing total wastewater treatment

REACTIVATION

Numerous installations have demonstrated the feasibility and economy of thermal reactivation. Exhausted granular carbon can be reactivated on your plant site in a high-temperature furnace, or it can be done by Calgon Carbon Corporation under a service agreement.

PACKAGING

- 55 Pound (25 kg) 5 Ply Bag
- 1,000 Pound (453.7 kg) Super Sack
- Bulk Trucks

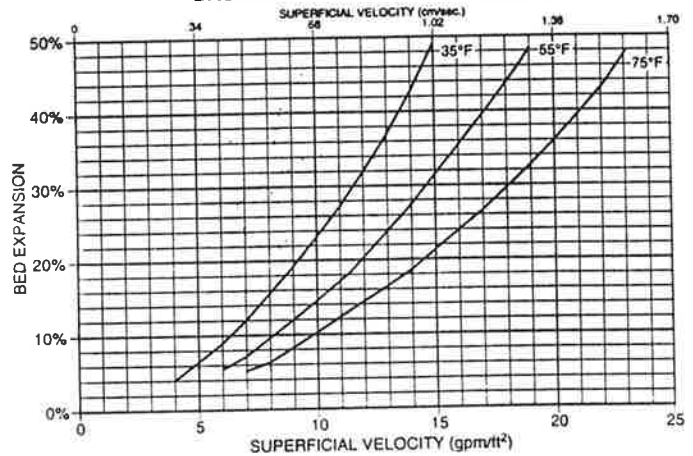
MANUFACTURING

Catlettsburg, KY
Pearlinton, MS

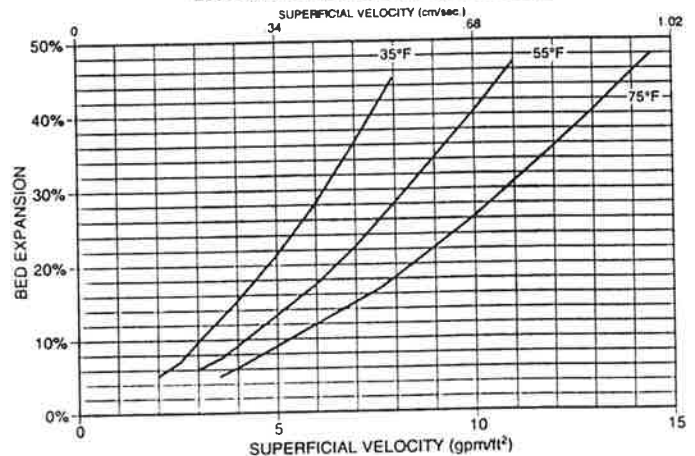
SPECIFICATIONS

	F300	F400
Iodine Number, mg/g (Min.)	900	1000
Moisture, weight % (Max. %)	2	2
Abrasion Number (Min.)	75	75
Effective Size, mm	0.8-1.0	0.55-0.75
Uniformity Coefficient (Max.)	2.1	1.9
Sieve Size, U.S. Sieve Series, weight %		
Larger than No. 8 (Max.)	15	15
Smaller than No. 30 (Max.)	4	4
Larger than No. 12 (Max.)	-	5
Smaller than No. 40 (Max.)	-	4

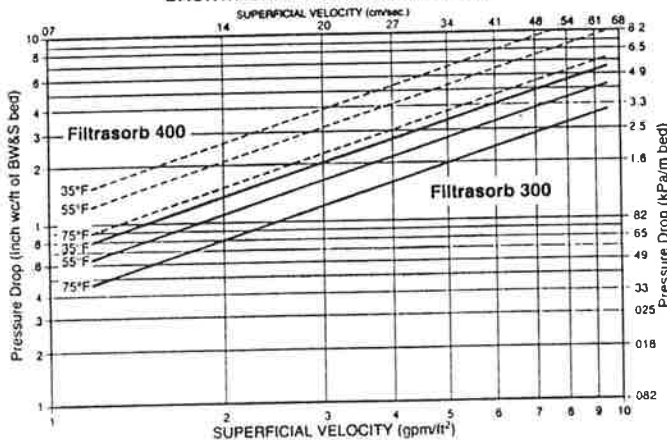
**FILTRASORB 300 - BED EXPANSION
BACKWASHED & SEGREGATED BED**



**FILTRASORB 400 - BED EXPANSION
BACKWASHED & SEGREGATED BED**



**FILTRASORB DOWNFLOW PRESSURE DROP
BACKWASHED & SEGREGATED BED**



FEATURES

- High surface area
- Abrasion resistance
- High density
- Optimum pore size

BENEFITS

- Filtrasorb carbons can be reactivated repeatedly and returned to service to provide maximum economy.
- Systems using Filtrasorb carbons can accommodate changes in flow rates and increases in concentration of pollutants whether caused by spills, peak loads, pretreatment upsets or other variations in the wastewater effluent.
- Because of its high surface area and abrasion resistance, Filtrasorb carbons can be reactivated repeatedly and returned to service to provide maximum economy.
- Filtrasorb carbons are of high density, wet readily, and do not float, thus minimizing loss during backwash operations.
- These carbons are produced with an exceptionally high internal surface area of optimum pore size for adsorption of both high and low molecular weight pollutants.

SAFETY MESSAGE

Wet activated carbon preferentially removes oxygen from air. In closed or partially closed containers and vessels, oxygen depletion may reach hazardous levels. If workers are to enter a vessel containing carbon, appropriate sampling and work procedures for potentially low oxygen spaces should be followed, including all applicable federal and state requirements.

1-800-4-CARBON

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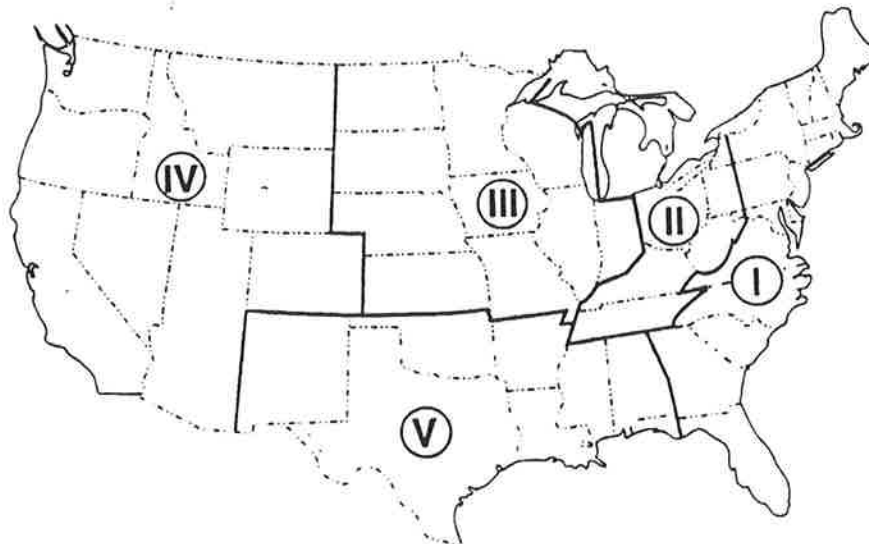
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Fax 32 2 770 93 94

If at any time our products or services do not meet your requirements or expectations, or if you would like to suggest any ideas for improvement, please call us at 1-800-548-1999. From outside the U.S. please call +1-412-787-6700.



CALGON CARBON CORPORATION