Final Report
Mitchel Field Remediation - 1A
Cement-Bentonite Vibratory-Beam
Containment Wall Construction
TP Industrial, Inc.
Garden City, New York

RECEIVED
OCT 30 1986
ENVIRONMENTAL QUALITY
REGION 1

Woodward-Clyde Consultants
[illegible]
[illegible]

5120 Butler Pike
Plymouth Meeting
Pennsylvania 19462
215-825-3000
Telex 846-343

Woodward-Clyde Consultants

October 2, 1986
85C2598-A

TP Industrial, Inc.
24600 South Main Street
Carson, CA 90749

Attention: Mr. Jeffrey Smith

FINAL REPORT
MITCHEL FIELD REMEDIATION - PHASE 1A
CEMENT-BENTONITE VIBRATORY-BEAM CONTAINMENT WALL CONSTRUCTION
TP INDUSTRIAL, INC.
GARDEN CITY, NEW YORK

Gentlemen:

Woodward-Clyde Consultants (WCC) is pleased to present our draft report covering the construction of a cement-bentonite containment wall using the vibratory-beam method. This containment wall is part of the remediation of the Mitchel Field site formerly owned by Purex.

Construction of the containment wall was performed by Slurry Systems, Inc. of Gary, Indiana as a subcontractor to Canonie Engineers, a subsidiary of Canonie, Inc. of Porter, Indiana. Actual installation of the containment wall began on December 5, 1985 and was completed on June 20, 1986. During this time, WCC provided full-time Resident Engineering Services to observe and document that the construction was performed in accordance with the plans and specifications and that field conditions were consistent with those assumed by the design.

We sincerely appreciate this opportunity of providing these engineering services and hope to continue providing these services on this project. If you have any questions concerning this report, please contact us.

Very truly yours,

WOODWARD-CLYDE CONSULTANTS

David S. McLay
Resident Engineer

for Richard M. Coad, P.E.
Project Manager

DSM/RMC/ten/WM 34

Enclosure

cc: Frank S. Waller - WCC
David Berz - Weil, Gotshal and Manges

FINAL REPORT
MITCHEL FIELD REMEDIATION - 1A
CEMENT-BENTONITE VIBRATORY-BEAM CONTAINMENT WALL CONSTRUCTION
TP INDUSTRIAL, INC.
GARDEN CITY, NEW YORK

Submitted to:

TP INDUSTRIAL, INC.

Carson, California

Prepared by:

WOODWARD-CLYDE CONSULTANTS

Plymouth Meeting, Pennsylvania

TABLE OF CONTENTS

LIST OF TABLES

LIST OF PLATES

LIST OF APPENDICES

INTRODUCTION

This report documents the construction engineering services provided by Woodward-Clyde Consultants (WCC) at the request of TP Industrial, Inc. (Purex), in connection with the construction of a cement-bentonite containment wall using the vibratory-beam method at the Mitchel Field site formerly owned by Purex in Garden City, New York. The site is shown on the Regional Location Plan on Plate 1. The containment wall was constructed in the area shown on Plate 2, Vibratory-Beam Containment Wall Location Plan.

The containment wall design was based on subsurface information developed by WCC; Camp, Dresser, & McKee of Boston, Massachusetts (CDM); and Goldberg-Zoino Associates of Newton Upper Falls, Massachusetts (GZA). Technical specifications for the containment wall were contained in the report, "Technical Specifications for Mitchel Field Transit Facility Site, Remedial Action - Phase I, Town of Hempstead, New York" (Technical Specifications), dated November 28, 1984, and prepared by CDM. The part of the Technical Specifications pertaining to the containment wall (Section 02395) is included as Appendix A. The initial design depth was based on boring logs by GZA.

Quality control procedures were contained in the report entitled "Quality Control Program, Mitchel Field Remedial Action, Phase 1A - Cement-Bentonite Containment Wall" (Quality Control Program), dated November 20, 1985, prepared by Canonie Engineers of Porter, Indiana (Canonie). The Quality Control Program is included as Appendix B. The results of the slurry testing were included in the daily reports previously submitted, and are summarized in Table 1. The daily beam penetration records are included as Appendix C.

PROJECT DESCRIPTION

A cement-bentonite vibratory-beam containment wall was constructed at the Mitchel Field site formerly owned by Purex as part of an overall remedial action plan to:

1. Minimize additional migration of contaminants from the source area.

2. Increase the efficiency of a flushing system in the source area--whose purpose is to flush contaminants from the unsaturated zone by introducing treated groundwater to the surface via a tile drain field--by reducing the inflow of groundwater into the source area during the pumping and flushing of the groundwater from within the containment wall.

The containment wall is included as part of the overall remedial action plan, as shown in the set of 23 drawings entitled "Mitchel Field Transit Facility Site, Remedial Action--Phase I," developed for Nassau County Department of Public Works by CDM. The cement-bentonite mix was reportedly developed by Canonie in conjunction with Slurry Systems, Inc. (SSI) of Gary, Indiana. The containment wall was constructed by SSI, a subcontractor to Canonie. Canonie was in charge of site control and health and safety.

The containment wall alignment was delineated by CDM, as shown on sheet G-1 of the CDM drawings. The wall line was laid out at the site by Sydney B. Bowne & Son of Mineola, New York on November 27, 1985. The grade and depth of the containment wall was designed by Canonie, based on the Technical Specifications prepared by CDM. The bottom of the containment wall was designed to penetrate 5 feet below the top of the clayey silt layer that is part of the Magothy Formation.

The containment wall was constructed a minimum of 4 inches wide by 1213.85 feet long in accordance with the Technical Specifications and the CDM drawings. The completed wall depth ranged from a minimum of 59.6 feet to a maximum of 68.0 feet. The total square footage of the containment wall was 76,651 square feet with an average depth of 63.15 feet.

RESIDENT ENGINEERING SERVICES

Woodward-Clyde Consultants (WCC) provided on-site resident engineering services on a full-time basis from November 26, 1985 to July 11, 1986. Our Resident Engineer, Mr. David S. McLay, worked closely with Mr. Richard M. Coad, Project Manager, and Mr. Frank S. Waller, Principal-in-Charge.

The Resident Engineer served as the on-site representative for Purex to observe and document the construction of the containment wall as the construction proceeded and any other activities on-site that were part of the overall remedial action plan. The Resident Engineer also provided Quality Assurance services, observing the testing of the slurry and beam penetrations to document that the testing and beam penetrations were performed according to the Technical Specifications and the Quality Control Program.

DAILY REPORTS

Daily reports were submitted by WCC on a weekly basis to Purex. These reports included a weekly summary and the results of the field slurry testing and beam penetration records, as well as other pertinent information.

CONTAINMENT WALL CONSTRUCTION

CONSTRUCTION PROCEDURE

The cement-bentonite containment wall was constructed using the vibratory-beam method. The equipment used for this method consists of a crane with fixed leads mounted on the boom, with the vibratory hammer and beam attached to the fixed leads, as shown schematically on Plate 3. Grout was mixed in a mixing plant and pumped to the beam. The beam was initially placed in a starter trench excavated prior to beam placement that was about 24 inches wide and 18 inches deep for the length of the wall. The purpose of the starter trench was to contain excess slurry and to maintain a constant head of slurry on the wall during beam driving, beam extraction, and during the initial consolidation after placement.

The actual placement of the wall consisted of driving a beam, typically of the dimensions and configuration shown on Plate 3, into the ground using a vibratory hammer. During penetration, grout was being pumped to the beam from the mixing plant and out of the grout nozzles at the bottom of the beam. The bottom of the beam was 4 inches wide on the web, which gave the wall its thickness. This grout injection during penetration kept the nozzles open and provided lubrication of the beam. When the beam reached the design depth, the beam was extracted while the grout was being continuously pumped, with the extraction rate and pumping rate such that the head of slurry in the starter trench did not diminish, filling the 4-inch void created by the extraction of the beam. The entire apparatus was then moved to the next beam insertion, the movement taking place so that the fin, a projection from the back side of the beam, would follow the path of the previous beam insertion. This process was repeated until the wall was completed.

The soil conditions encountered during the initial construction of the wall required an additional step in the construction procedure described above. This additional step consisted of preaugering with a continuous-flight auger that was side-mounted adjacent to the beam on the fixed leads. This preaugering was generally done at 3-foot intervals. The preaugering will be described in greater detail later in this report.

HEALTH AND SAFETY

The construction of a cement-bentonite containment wall using the vibratory-beam method minimized the amount of material excavated due to the nature of the construction method. The greatest risk of exposure to volatile organics occurred during the various excavations that were necessary to complete the containment wall. The open excavations necessary for construction were the excavation of the 18-inch-deep starter trench, excavations to locate utilities, excavations to remove and block off the 8-inch roof (storm) drain and the two ends of the 42-inch storm drain, and excavations to remove obstructions. The locations of the roof drain and storm drain are shown on Plate 2, and the locations of obstruction removal are shown on Plate 4, As-Built Stationing Plan.

As part of the construction of the slurry wall, Canonie implemented a Health and Safety Program for the Mitchel Field site, which is included as Appendix D. This health and safety plan provides for a contingency plan including action levels for the upgrading of protection and a list of the required protective equipment, air monitoring procedures, a discussion of the work zone, chain-of-command, and emergency procedures.

The air monitoring program consisted of both continuous monitoring at air monitoring stations located on the perimeter of the construction area and monitoring in the breathing zone of the work area when any intrusive work was in progress, such as excavations for utilities or during preaugering. The air monitoring equipment used for all air monitoring was the Century/Foxboro OVA-128 Organic Vapor Analyzer (OVA). The continuous monitoring stations were also equipped with strip-chart recorders and one of the OVAs on-site was equipped with a field gas chromatograph.

The background levels at the continuous air monitoring stations ranged from 4 to 10 ppm, depending on wind direction and the amount of vehicular traffic in the area. A permanent record of the air monitoring records was kept by Canonie with a copy submitted to Nassau County.

During the construction of the containment wall, the level of protection remained at Level D, with the exception of the morning of June 5, 1986. On that morning, the observed organic vapor levels, during the extraction of the auger used in preaugering, required the dockbuilder working by the trench and the person doing the air monitoring to don boots and respirators. This occurrence was only for a short duration, as later that morning the wind picked up and vapor levels in the breathing zone were below the first action level.

The only area where organic vapors were detected during any excavation was in the area between Stations 0+00 and 0+50, where the removal of obstructions necessitated excavating 6- to 8-foot-deep trenches. The material excavated during obstruction removal was kept separate from the rest of the spoil on-site, but did not exceed the level of contamination necessary to be treated as a hazardous material as stated in the Technical Specifications by CDM. The material was kept on-site and is still there at this time.

Preaugering also caused the release of organic vapors, with the highest concentrations (80 parts per million for a 1- to 5-second duration) occurring between Stations 0+00 and 2+50. Organic vapors were detected in other areas during preaugering, but at no time did vapor levels require the upgrading of the level of protection, with the exception of the case noted above, as required by the health and safety plan. The nearly continuous presence of wind, typical for Long Island, was a major factor in keeping the concentration of organic vapors below the action levels in the breathing zone.

Another aspect of the Canonie Health and Safety Program required the monitoring of the vibrations throughout the construction of the containment wall. Monitoring of vibrations using velocity transducers was performed by Canonie initially at three different locations: the existing bus garage, at Commander Oil Corporation located on the north side of Commercial Avenue, and at various businesses in the surrounding area. The monitoring equipment measured the ground velocity at a frequency range of up to 100 cycles per second. Monitoring of the vibrations by Canonie continued throughout the construction, with strip-chart recorders and daily logs providing a permanent record. These records were kept by Canonie, with a copy submitted to Nassau County.

When beam driving started, complaints about the vibrations by area businesses prompted Canonie to bring in a vibration expert from Stone & Webster Engineering Corporation, Boston, Massachusetts, to accurately determine the displacement amplitude and frequency of the vibrations. The analysis of the vibrations by Stone & Webster was done by monitoring at 15 locations near the beam driving and at various businesses in the area with equipment capable of analyzing both the frequency and displacement amplitude.

The results presented in the Stone & Webster report "Vibration Survey During Construction of a Vibrated-Beam Slurry Wall," dated March 17, 1986, stated that the frequency of the vibrations were not in the range that could cause damage to structures at the various locations monitored. The maximum displacement amplitude from the vibrations, measured 30 feet from the beam driving on-site, would fall under the category of "severe to persons" and the highest measurement off-site would be considered "troublesome to persons," determined using Vibration Susceptibility Criteria. The vibrations at other locations ranged from "easily noticeable to persons," to "barely noticeable to persons." The report concludes that the vibration levels at all locations were "low enough such that they should not adversely affect the integrity of structures."

STATIONING

The stationing used for the containment wall construction was laid out at the site by Sydney Bowne & Son. The original stationing was generally followed with the exception of two locations, as shown on Plate 4, As-Built Stationing Plan. The trench realignment beginning at Station 2+80.45 was necessitated by the presence of the telephone junction box located just north of the wall. The trench line was moved south 4 feet south to avoid having the tracks of the crane run over the box, possibly causing damage. Plate 5 shows the trench realignment in greater detail. The trench realignment rejoined the original trench line at a new corner having the following equivalent stationing Station 4+04.09 equals Station 4+15.47. The realignment results in a shortened wall length of 4.91 feet (original Corner 1 at Station 4+09.00 minus new Corner 1 at Station 4+04.09). The section between original Corner 1 and Station 4+15.47, which equals 6.47 feet, was placed prior to the decision to realign the trench and was included as part of the wall for billing purposes between Canonie and SSI.

The trench realignment, beginning at Station 9+55.77, was necessary in order to avoid three beam penetrations that were not plumb vertically, transverse to the trench alignment. The original trench line was rejoined at Station 9+86.83, and this change shortened the wall by 2.49 feet. Plate 5 shows this trench realignment in greater detail.

These two changes account for the shortening of the total wall length from 1221.25 feet to 1213.85 feet. The actual circumscribing length of the wall is 1207.38 feet, which accounts for the 6.47 feet completed from the original Corner 1 (Station 4+09.00) to the point at which the trench realignment starting at 2+80.45 rejoins the original trench line (original Station 4+15.47, which became Station 4+04.09).

VIBRATORY-BEAM CONTAINMENT WALL INSTALLATION

SSI completed mobilization of the single electric vibratory hammer by December 5, 1985, and the first beam driving was started late in the afternoon that day. The first beam was driven outside the wall line as a test. This first penetration with the single hammer proved difficult and, after unsuccessfully attempting to drive two more beams with the single hammer, SSI decided to bring on-site a tandem electric vibratory hammer. This tandem hammer could reportedly generate twice the driving force of the single hammer, and it was anticipated that this hammer would enable production to proceed as planned.

SSI completed installing the tandem hammer on December 20, 1985, but problems and the holidays prevented any production until January 3, 1986. Three beams were driven on this day, but the beams were not plumb vertically (transverse to the trench alignment), and this area was left and driving was restarted at Station 9+86.83 on January 9, 1986. These skewed beam penetrations necessitated the wall alignment change at Station 9+55.77, as shown on Plate 5.

Beam driving continued with the tandem hammer, but problems arose with the penetration rate due to densification of the soil. Previous beam penetrations apparently increased the density in a zone around the driving area, making subsequent drives difficult, which increased wear and tear on the hammers and eventually bent the beam. SSI decided at this time to bring Hydrogroup, Inc. of Hauppauge, New York (Hydrogroup) on-site to predrill ahead of beam driving, placing grout in the hole in order to keep the hole open. Hydrogroup came on-site January 17, 1986 and, starting at Corner 5, completed nine relief holes by January 20, 1986. Predrilling helped the beam penetrate, this was especially evident when SSI drove beams past the area predrilled on January 23, 1986 beam penetrations became much more difficult and another beam was bent. SSI brought Hydrogroup back on-site and predrilled holes for the rest of the uncompleted interval between Corners 5 and 6, and the wall section between these corners was completed by February 12, 1986. SSI halted production at this time to mount a continuous-flight auger on the side of the fixed leads for predrilling.

The continuous-flight auger mounting was completed by February 24, 1986, and SSI was able to predrill to a depth of 57 feet. Predrilling consisted of aligning the drill on the centerline of the wall and then drilling a relief hole as far as the auger could penetrate. The auger was then extracted, turning in the same direction as during penetration. Predrilled holes were usually drilled in groups of three or four, spaced generally 30 inches apart. After predrilling, enough beams were driven so that two previously predrilled holes remained between the last beam driven and the first new hole drilled.

Wall installation then proceeded along the southernmost wall section with steady production. This situation changed when beam driving started at the area by the existing bus garage. Beam penetrations became much more difficult and problems with the tandem electric hammer increased, causing an increase in downtime. Auger sections were added so that the drill depth increased to 61 feet; however, this did not increase the production rate. Canonie, as the Prime Contractor, decided to replace the tandem electric hammer with a hydraulic vibratory hammer, which began on April 18, 1986. This replacement was completed by April 22, 1986 but, during the first drive with the hydraulic hammer, a fire destroyed the power pack for the hammer and replacement of the power pack was completed April 30, 1986.

Wall production resumed on May 1, 1986, using the hydraulic vibratory hammer. Hard driving continued and the augers were extended so a depth of 68 feet could be attained. This extension, plus the fact that grout was at this time being tremmied into the predrilled holes during extraction, aided penetration in this hard-driving area.

On May 15, 1986, problems developed with the hydraulic jaws that grip the beam. The hydraulic jaws supplied with the hydraulic hammer developed a crack in the main piston, and SSI replaced these jaws with ones from the electric hammer. However, the jaws from the electric hammer did not align properly with the hydraulic hammer and an adapter plate had to be fabricated. This adapter plate was completed and installed by May 27, 1986.

The section of the wall by the bus garage was completed on May 31, 1986, and then the crane was moved to the wall section along Commercial Avenue. Production proceeded along Commercial Avenue at a much faster pace due to the change in drive characteristics--the drive times were much shorter and the hydraulic hammer cut down on the downtime. The wall was completed on June 20, 1986.

Plate 6 graphically presents the production rate versus time and notes the incidents that halted production for an extended length of time.

CEMENT-BENTONITE GROUT

The cement-bentonite grout used for the containment wall was batch-mixed in the percentages outlined in Appendix A. SSI tested nearly every batch of slurry for viscosity, density, and filtrate loss, as stated in the Quality Control Program. In addition to the daily field testing, Canonie obtained samples on a daily basis for laboratory testing, which consisted of testing for unconfined compressive strength and triaxial permeability.

FIELD TESTING

The minimum viscosity of 35 Marsh seconds and minimum density of 1.07 grams per cubic centimeter (gm/cc) were met or exceeded by every batch tested, and the maximum filtrate loss of 60 milliliters (ml) in 30 minutes was met in nearly all tests. When the filtrate loss exceeded the specifications, SSI took appropriate corrective measures--either decreasing the amount of water in the mix or increasing the amount of Tamol, a dispersant that enables the bentonite to adsorb more free water. A Summary of Grout Properties is presented in Table 1.

In order to reduce the time needed for each slurry test, a relationship was established at the beginning of construction that related the value of the filtrate loss at 7.5 minutes to the value at 30 minutes. The value of filtrate loss at 7.5 minutes was doubled plus two, with this relationship checked on a regular basis by noting the filtrate loss at 7.5 minutes and letting the test run for the full 30 minutes. Plate 7 shows the results of verifying this relationship. This plate illustrates that the computed value of the filtrate loss using the 7.5-minute value is accurate to plus or minus 1 ml when compared to the actual 30-minute value for the range of the 7.5-minute values obtained.

LABORATORY TESTING

Tests for both unconfined compressive strength and triaxial permeability were performed at the soils laboratory of Converse, Ward, Davis, and Dixon, of Bells Mills, New Jersey. Table 2 presents a Summary of Laboratory Permeability Data. Permeability was tested on 12 samples, and the results ranged from a minimum of 6.5×10^{-7} centimeters per second (cm/sec) to a maximum of 1.7×10^{-6} cm/sec, with an average of 8.9×10^{-7} cm/sec. Unconfined compressive strength was tested on 49 samples, with a minimum strength of 0.8 pounds per square inch (psi) to a maximum strength of 7.2 psi, with an average strength of 3.2 psi. The minimum strain was 0.9 percent, the maximum strain was 4.6 percent, and the average strain was 1.8 percent. A summary of all the laboratory grout testing is included as Appendix E. Table 3 presents a Statistical Summary of the Laboratory Data.

GROUT TAKE

While driving the beam, grout was injected simultaneously to decrease the driving effort. As shown on Plate 3, the nozzles for grout injection are near the tip of the beam, thus allowing grout to be forced into the formation during driving, with the total volume of grout used during construction of the containment exceeding the theoretical volume created by the beam. The total amount of grout pumped during construction was 2230 cubic yards, but the theoretical void created by the beam accounts for only 915 cubic yards. Some of the used grout went to fill the starter trench (estimated volume for the starter trench was 136 cubic yards) with the value estimated for the starter trench doubled to account for waste during construction (broken hoses, overflowing the starter trench, etc.). Therefore, the remaining grout unaccounted for most likely went into the formation during the driving of the beam. Table 4 shows the average volume of grout injected per linear foot for approximately each 50-foot increment of containment wall, and Appendix F presents a summary of daily grout take. The amount of grout take varied with the penetration rate of the beam and the thickness of penetration into the Upper Magothy. This variability of grout take could cause the wall thickness to vary, but it is likely that the wall thickness (beam void plus penetration into the formation) exceeds the specified 4 inches throughout the containment wall.

In order to obtain an in situ wall sample, Canonie excavated next to the wall to a depth of 10 feet at Station 10+06 and removed part of the wall so that the wall could be seen in cross section. The observed wall section consisted of an inner layer and two outer layers. The inner layer was about 8 inches thick and consisted of grout only, with the two outer layers consisting of a mixture of sand and grout, each about 3 inches thick, for a total wall thickness at this location of 14 inches. While this observed thickness may not be representative of the entire wall, it does provide some visual evidence that the wall thickness does exceed the specified 4 inches.

OBSTRUCTIONS

During the installation of the containment wall, obstructions were encountered at the three locations shown on Plate 4. The first obstruction was encountered at Station 6+85 on March 28, 1986. The obstruction was an old concrete slab and removal took one day. The second area where obstructions were encountered was between Stations 0+00 and 0+50 on June 2 and June 3, 1986. These obstructions appeared to be old foundations and building rubble, with removal completed in less that two days. The third obstruction was encountered on June 14, 1986, at Station 3+40. Initially, some concrete rubble was encountered and removed from the trench line but, during removal of the concrete, a 12,000-gallon steel tank was uncovered. The tank had to be removed before wall production could be completed in this area. The removal of the tank was completed on June 18, 1986.

UTILITY AND DRAIN CROSSINGS

Utilities for the existing bus garage--telephone, electric, and water--were crossed twice in order to complete the containment wall. The electric and telephone lines were immediately adjacent to each other and were found by excavating one trench. The water main was inadvertently broken during the first time it was crossed and restoring service to the bus garage took a half day. The locations of the utilities are shown on Plate 2.

The containment wall directly under the utilities was completed by excavating and exposing the utility and then placing the fin of the beam underneath the utility line and driving the beam at an angle so that the beam went under the utility. Once this beam was completed, the beam was placed on the opposite side of the utility line with the flange as close to the line as possible. This beam was then driven at an angle opposite the first drive so that the beam penetrations would meet at a point well above the water table. Once these beams were completed, driving could continue in the normal manner. Appendix G contains field sketches of the utility crossings.

The containment wall also crossed a 42-inch storm sewer line and an 8-inch roof drain, as shown on Plate 2. These utilities were removed before beam driving occurred, with the ends blocked off so that slurry would not be lost when beams were driven in these areas. The 42-inch storm sewer was to be abandoned and replaced as part of the new bus garage construction. The roof drain will continue to be in use for at least one year, until the first phase of the new bus garage is completed. As a temporary measure, Canonie removed the bottom of a junction manhole located outside the containment wall to allow the roof drain to function by using the manhole as a recharge pit into the glacial material.

CONTINUITY

In order to provide a high degree of assurance that the wall would be continuous, each beam overlapped the previous beam insertion at least 10 percent of the overall depth of the beam (the depth of the beam flange to flange). This overlap and the fin attached to the beam also guided the new beam penetration along the path of the old penetration, reducing the possibility of gaps along the wall.

Another aspect of continuity is the assurance that beams were driven vertical. This was done by checking the beam alignment both parallel and transverse to the trench alignment. The verticality of the beam parallel to the trench alignment for each beam insertion was checked by using a surveying transit to make sure that the beam was on-line for the entire length of the beam prior to driving. Beam alignment in the direction transverse to the trench alignment was done with a 4-foot carpenter's level.

The only location where beam verticality did not meet specifications occurred on January 3, 1986. This is the location where the trench alignment was changed to avoid this area, starting at Station 9+55.77 (Plates 4 and 5), as previously discussed in the section on stationing.

WALL DEPTH

The depth of beam penetration was determined by the use of a surveyor's transit. The height of the instrument was determined, then the elevation of beam tip was computed using the height of the instrument, and the penetration length was read directly off the beam, using the foot-increment marks welded onto the beam. The elevation of the beam tip was recorded and the depth was determined using the surface elevations established prior to the start of construction. At the end of each day, the beam penetration depth was averaged and used to determine the square footage completed. Plates 8 through 11 show the as-built profile of the wall, with the average daily beam tip elevation used to show the daily bottom elevations.

The average daily tip elevations were used primarily for purposes of calculation of the square footage of wall completed. Individual beam tip elevations usually varied on a daily basis from 0.2 to 0.3 feet, depending on design elevation changes. There were exceptions to this amount of variability in beam tip elevation, with the highest being 5 feet on May 31, 1986, as shown on Plate 10. Some other daily beam tip elevation variabilities ranged from 0.8 to 1.1 feet, with most of these occurring in the area of hard driving between Stations 4+00 and 7+00.

MAGOTHY CLAYEY SILT KEY

The containment wall was designed to key a minimum of 5 feet below the top of a clayey silt layer located at or near the top of the Magothy Formation. The Technical Specifications stated that samples of the material below the bottom of the containment wall were to be obtained every 15 feet with a split-spoon attached to the fin of the beam. This method of sampling was not successful, so SSI brought Hydrogroup on-site to sample along the wall to confirm key material and to determine the elevation of the top of the clayey silt layer in the Upper Magothy along the trench alignment. Hydrogroup drilled nine borings, sampling from elevation 22 to elevation 16, for a frequency of one every 135 feet. The boring logs of the Hydrogroup borings are presented in Appendix H.

The as-built profiles (Plates 8 through 11) contain the following:

- The GZA borings and the clayey silt thickness reported in the boring logs.

- The Hydrogroup borings, showing the sampled interval and the clayey silt thickness reported in the boring logs.

- The top of the clayey silt layer along the trench alignment, inferred from the GZA borings and used to determine the design depth prior to construction.

- The top of the Magothy Formation along the trench alignment, inferred from the GZA and WCC borings.

- The average daily beam tip elevations.

Plate 12 shows the boring locations and, where determinable, the top of the Magothy Formation, the top of the clayey silt layer, and thickness of the clayey silt layer. Plate 13 is a contour map of the top of clayey silt generated from the top of clayey silt layer elevations on Plate 12. Plate 14 is a contour map of the top of the Magothy Formation inferred from the GZA and WCC borings, as listed on Plate 12. The material that is part of the Magothy Formation that overlies the clayey silt layer consists of very dense silty fine sands, determined from the GZA boring logs.

The as-built profiles show that the 5-foot key below the top of the clayey silt layer was generally obtained for the wall, with some exceptions. The areas where the 5-foot key was not obtained were mainly between Stations 5+00 and 6+00 and 8+30 to 12+00. The key below the clayey silt layer in these areas ranges from 3 to 5 feet. The as-built profiles also show the top of the Magothy Formation, which shows that in the area where the 5-foot key was not obtained, the penetration into the Magothy Formation was much greater than 5 feet, ranging from 7 to 12 feet.

The frequency of sampling was much less than the specified key sampling frequency of once every 15 feet; however, the characteristics of the beam penetration near the key material was also used as a visual indicator of key penetration. The nature of the key material was receptive to beam penetration along most of the wall length, and the beam penetrated at a much greater rate when the key material was encountered. The only area along the wall where the change in drive characteristics was not encountered was between Stations 4+00 and 7+00; this could have been due to the amount of Upper Magothy silty fine sands that occurred above the Magothy clayey silt layer, as shown on the as-built profiles.

EVALUATION OF RESULTS

Summarized in this section is our evaluation of the construction of the containment wall relative to the drawings, specifications, and design intent. This evaluation is based upon the Resident Engineer's observations, field testing, and laboratory test results.

FIELD TEST RESULTS

Field tests were conducted to evaluate the containment wall construction as it proceeded so that any necessary changes could be made in a timely manner. Individual test results do not constitute accept/reject criteria. In all cases where a test indicated nonconformance with the specifications, the contractor used this information to take appropriate corrective actions. The following specifications were taken from the Quality Control Program by Canonie and the Technical Specifications developed by CDM.

VISCOSITY

Viscosity shall not be less than 35 Marsh seconds using the Marsh Funnel, as outlined in American Petroleum Institute (API) Method RP-13B. Out of 645 tests, 11 were indeterminate (the slurry was too thick), but all the other tests exceeded the minimum viscosity of 35 Marsh seconds.

DENSITY

Unit weight (density) shall not be less than 1.07 grams per cubic centimeter (gm/cc) and not more than 1.50 gm/cc, as determined by the Mud Balance Test API RP-13B. All of the 645 density tests performed fell within the required density range.

FILTRATE LOSS

Water loss shall not be greater than 60 cubic centimeters at 100 psig when tested for 30 minutes, in accordance with API RP-13B, "Low Temperature Filtration Test." A total of 644 filtrate loss tests were performed, with 8 exceeding the limit value of 60 cubic centimeters. Note that the test for filtrate loss was modified, using the filtrate loss value at 7.5 minutes, doubling it, and adding 2. This relationship was checked with a total of 50 tests run for the full 30 minutes.

CONTAINMENT WALL CRITERIA

The criteria for containment wall required a 4-inch minimum beam width, with the key penetrating 5 feet into a clayey silt layer in the Magothy Formation. The beams used to construct the wall all had a web thickness at the bottom of 4 inches, which maintained the thickness of the wall. The minimum key depth of 5 feet below the Upper Magothy clayey silt layer was not maintained throughout the length of the wall in the areas mentioned previously, based on the GZA and Hydrogroup borings. Penetration into the Magothy Formation in the areas that did not penetrate 5 feet into the top of the clayey silt layer penetrated into the Magothy Formation from 7 to 12 feet, as shown on the as-built profiles.

LABORATORY TESTS

GROUT PERMEABILITY

No minimum value is given in the Quality Control Program. However, the Technical Specifications give a maximum value of 1×10^{-7} cm/sec, tested according to Army Corps of Engineers Manual No. EM1110-2. A total of 12 tests were performed and all of the permeabilities reported were greater than the specified permeability, with the average being 8.9×10^{-7} cm/sec.

However, it should be noted that the method of testing used to determine permeability probably did not test the in situ permeability. The presence of a filter cake on both sides of the in situ wall lowers the permeability, and this reduction in permeability could not be tested for, due to the nature of the sampling method. The test samples of the grout were obtained from the grout nozzles on the beam, placing the grout in cardboard tubes and allowing the grout to cure for at least 28 days before testing. No filter cake was formed in the sample. The fact that the in situ containment wall most likely has a lower permeability that the laboratory permeability and the wall is likely to be thicker than the 4-inch beam void (inferred from the grout take), the as-built wall appears to satisfy the intent of the containment wall design: to minimize the flow of water across the barrier during the pump and flush operation to cleanup the source area.

UNCONFINED COMPRESSIVE STRENGTH

No minimum value is given in the Quality Control Program, but the Technical Specifications give a minimum value of 5 percent strain, tested in accordance with ASTM D 2166. No value is given in either the Quality Control Program or the Technical Specifications regarding compressive strength. A total of 44 unconfined compression tests were performed, and all of the tests failed to meet the 5 percent strain minimum.

CONCLUSIONS

The vibratory-beam cement-bentonite containment wall constructed by Slurry Systems, Inc. as a subcontractor to Canonie Engineers at the Mitchel Field site formerly owned by Purex was generally in accordance with the plans, specifications, and design intent. The wall meets or exceeds the minimum wall thickness of 4 inches, and the in situ permeability of the wall most likely will be such that the wall should perform as the design intended. The key thickness of 5 feet from the top of the clayey silt layer in the Magothy Formation was not met in certain areas, based on the GZA and Hydrogroup borings. However, the depth of penetration into the silty fine sands of the Magothy Formation that occur above the clayey silt layer and the probability that the clayey silt layer was penetrated a minimum of 3 feet in all areas should enable the wall to perform satisfactorily to minimize groundwater infiltration during the pump and flush cleanup operations in the source area.

DSM/ten/WM 34

Tables

TABLE 1

SUMMARY OF GROUT PROPERTIES
MITCHEL FIELD REMEDIATION - PHASE 1A
TP INDUSTRIAL, INC.
GARDEN CITY, NEW YORK

December 5, 1985 to June 20, 1986	Viscosity (seconds)	Density (gms/cm3)	Filtrate Loss (ml/30 min)
Number of Tests	645	645	644
Average	45.8	1.116	48.5
Standard Deviation	7.4	.010	6.3
Minimum Value	35	1.07	27
Maximum Value	120	1.18	75
Specifications	35	1.07	60

TABLE 2

SUMMARY OF LABORATORY PERMEABILITY DATA
MITCHEL FIELD REMEDIATION - PHASE 1A
TP INDUSTRIAL, INC.
GARDEN CITY, NEW YORK

Sample No.	Date Sampled/Date Tested	Station	Permeability ($x 10^{-7}$ cm/sec)
4	1-14-86/2-13-86	10+83	6.5
8	1-22-86/2-21-86	11+27	9.7
10	1-30-86/2-28-86	11+51	9.1
17	2-27-86/4-12-86	10+27	7.0
24	3-06-86/4-06-86	9+39	7.1
36	3-18-86/4-18-86	7+79	17.0
45	3-25-86/4-23-86	7+20	8.3
54	4-07-86/5-07-86	4+46	8.8
63	4-15-86/5-15-86	4+97	7.6
75	5-15-86/6-18-86	6+08	9.2
85	6-05-86/7-07-86	1+06	10.0
100	6-20-86/7-22-86	10+59	6.5

TABLE 3

STATISTICAL SUMMARY OF LABORATORY DATA
MITCHEL FIELD REMEDIATION - PHASE 1A
TP INDUSTRIAL, INC.
GARDEN CITY, NEW YORK

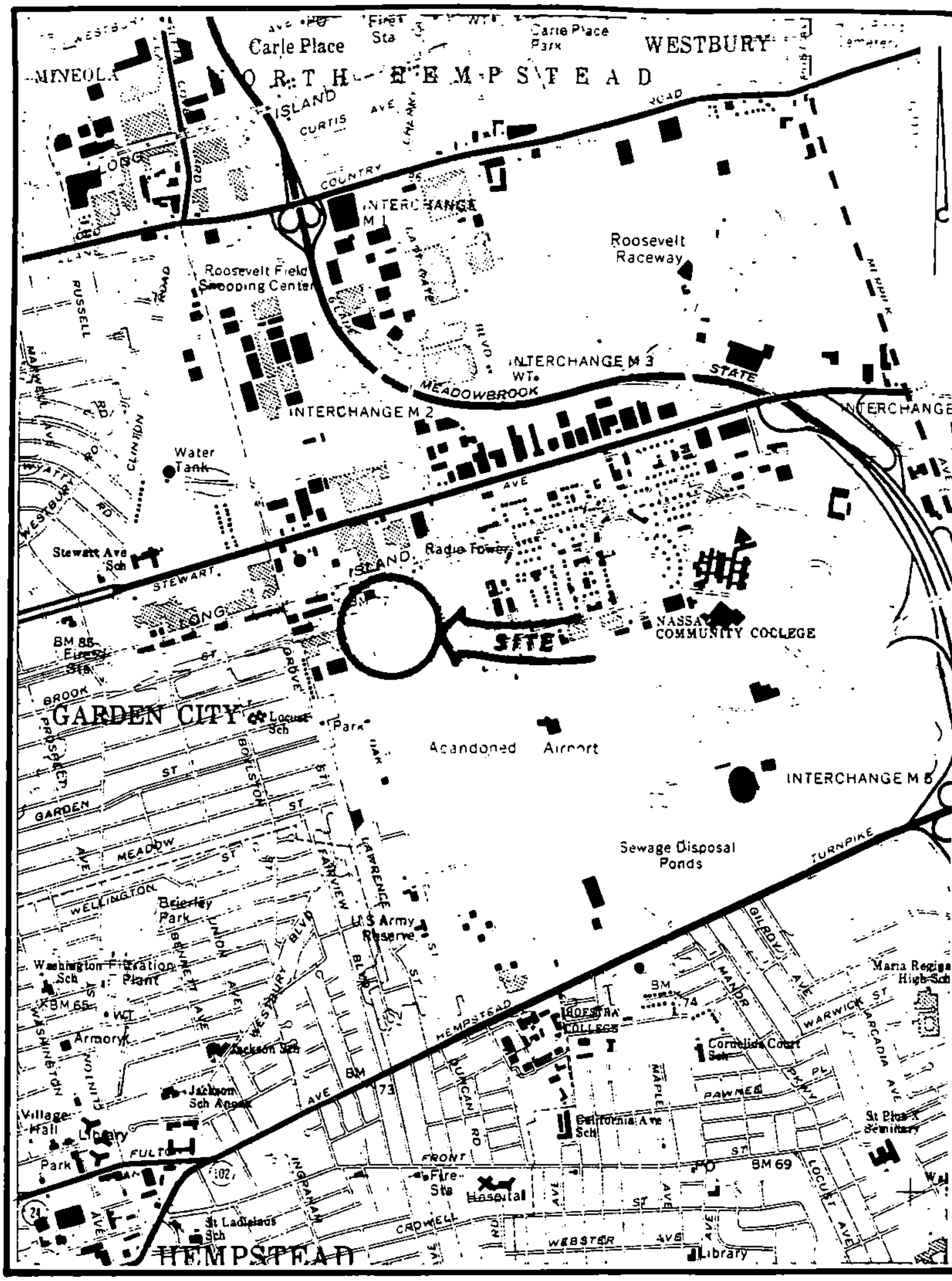
Test	Number of Tests	Minimum Test No.	Minimum Value	Maximum Test No.	Maximum Value	Average	Standard Deviation
Unconfined Compression							
Strength (psi)	49	77	0.8	1	7.2	3.2	1.5
Strain (%)	52	76	0.9	49	4.6	1.8	0.7
Permeability (x 10^{-7} cm/sec)	12	85.4	6.5	36	17.0	8.9	2.8

TABLE 4

AVERAGE VOLUME OF GROUT INJECTED PER LINEAR FOOT
FOR EVERY 50 FEET OF CONTAINMENT WALL
MITCHEL FIELD REMEDIATION - PHASE 1A
TP INDUSTRIAL, INC.
GARDEN CITY, NEW YORK

From Station	To Station	Average Grout Volume Per Linear Foot (Cu. Yds./Ft)
0+00	0+50	.93
0+50	1+00	1.25
1+00	1+50	1.20
1+50	2+00	1.03
2+00	2+50	1.20
2+50	3+00	1.27
3+00	3+50	1.35
3+50	4+00	1.60
4+00	4+50	2.26
4+50	5+00	1.75
5+00	5+50	2.34
5+50	6+04.66	1.88
6+04.66	6+50	1.73
6+50	7+00	2.52
7+00	7+50	2.00
7+50	8+00	1.60
8+00	8+50	1.60
8+50	9+01.32	1.93
9+01.32	9+50	1.65
9+50	10+00	1.94
10+00	10+50	1.50
10+50	11+00	2.50
11+00	11+50	1.65
11+50	1221.25	1.52
	Average	1.68

Plates

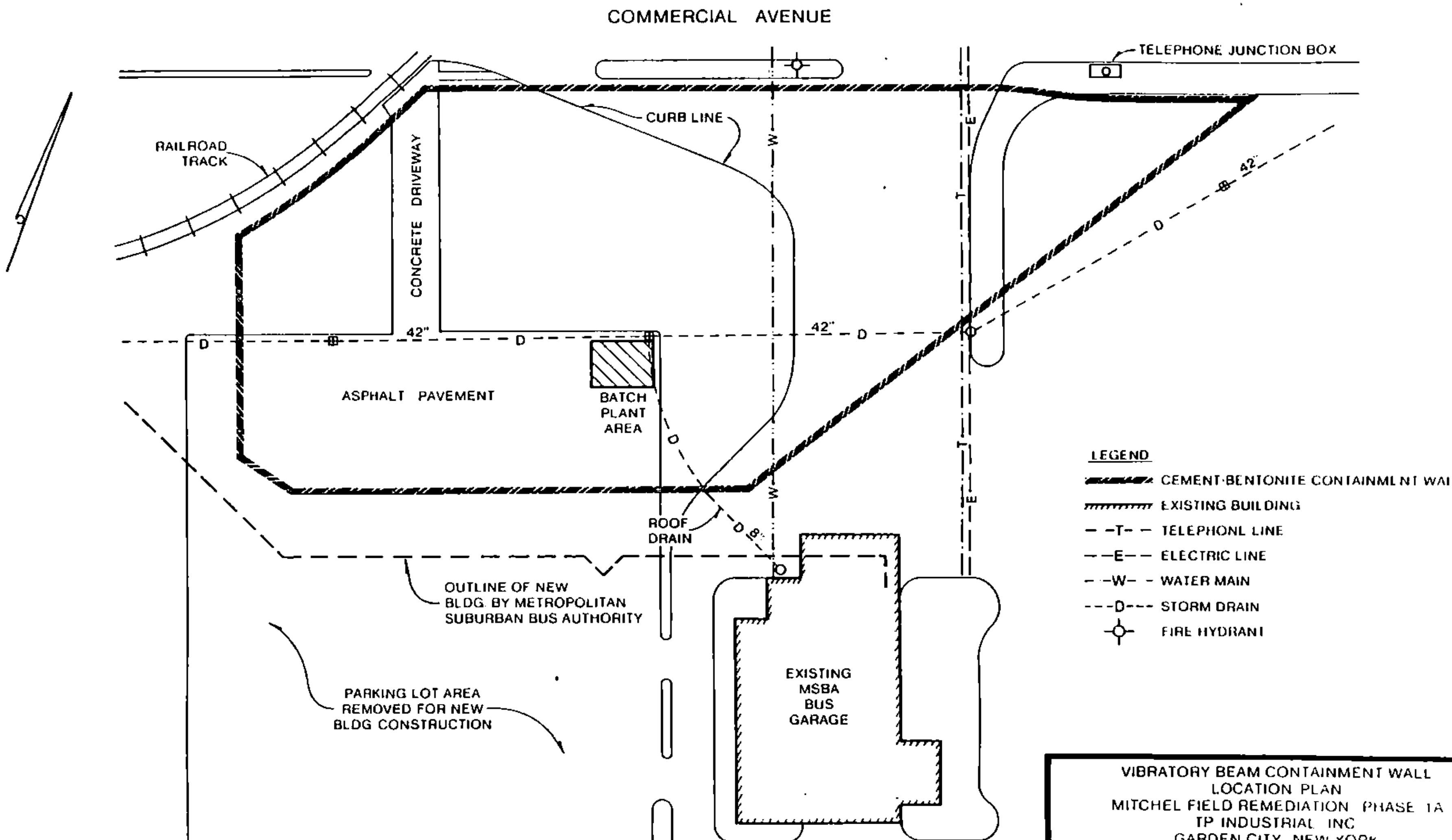


1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 .5 0 1 KILOMETER

REGIONAL LOCATION PLAN

PLATE 1



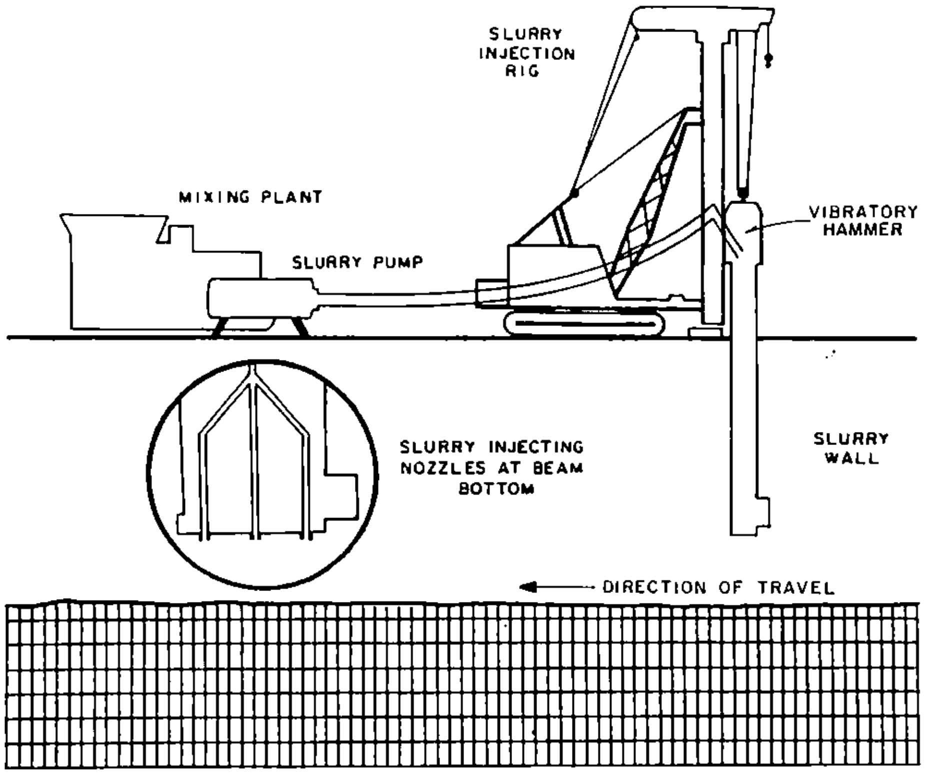
NOTE THIS PLAN WAS TAKEN FROM SHEET G 1. "SITE AND PIPING PLAN", OF 15 SHEETS ENTITLED MITCHEL FIELD TRANSIT FACILITY SITE REMEDIAL ACTION - PHASE 1 BY CAMP DRESSER AND McKEE

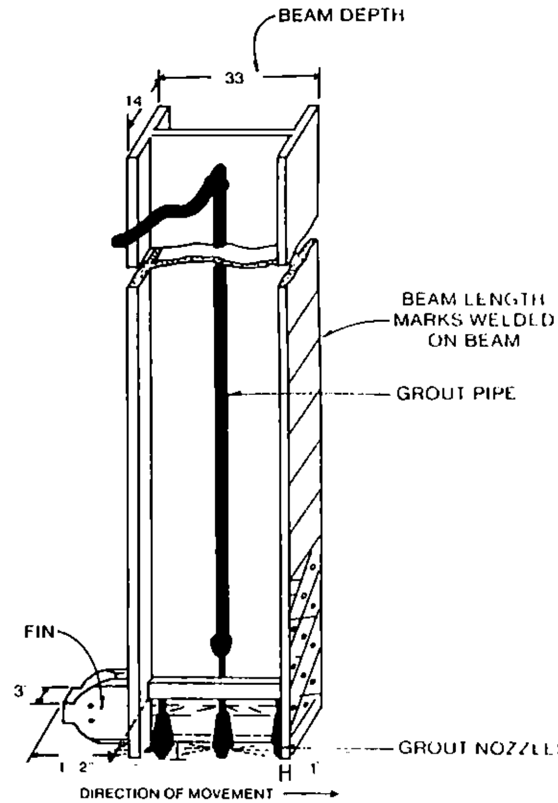
VIBRATORY BEAM CONTAINMENT WALL
LOCATION PLAN
MITCHEL FIELD REMEDIATION PHASE 1A
TP INDUSTRIAL INC
GARDEN CITY NEW YORK

WOODWARD-CLYDE CONSULTANTS

CONSULTING ENGINEERS

Drawn by	D B	SCALE IN FEET	7/22/86
Checked by	D.S M	0 — 50	85C2598 A





SCHEMATIC OF A VIBRATED BEAM WALL
MITCHEL FIELD REMEDIATION PHASE IA
TP INDUSTRIAL INC
GARDEN CITY NEW YORK

WOODWARD-CLYDE CONSULTANTS

CONSULTING ENGINEERS [illegible]

Drawn by	D B	SCALE [illegible]	Date 7/18/86
Checked by	D S M		85C2598 A

PLATE

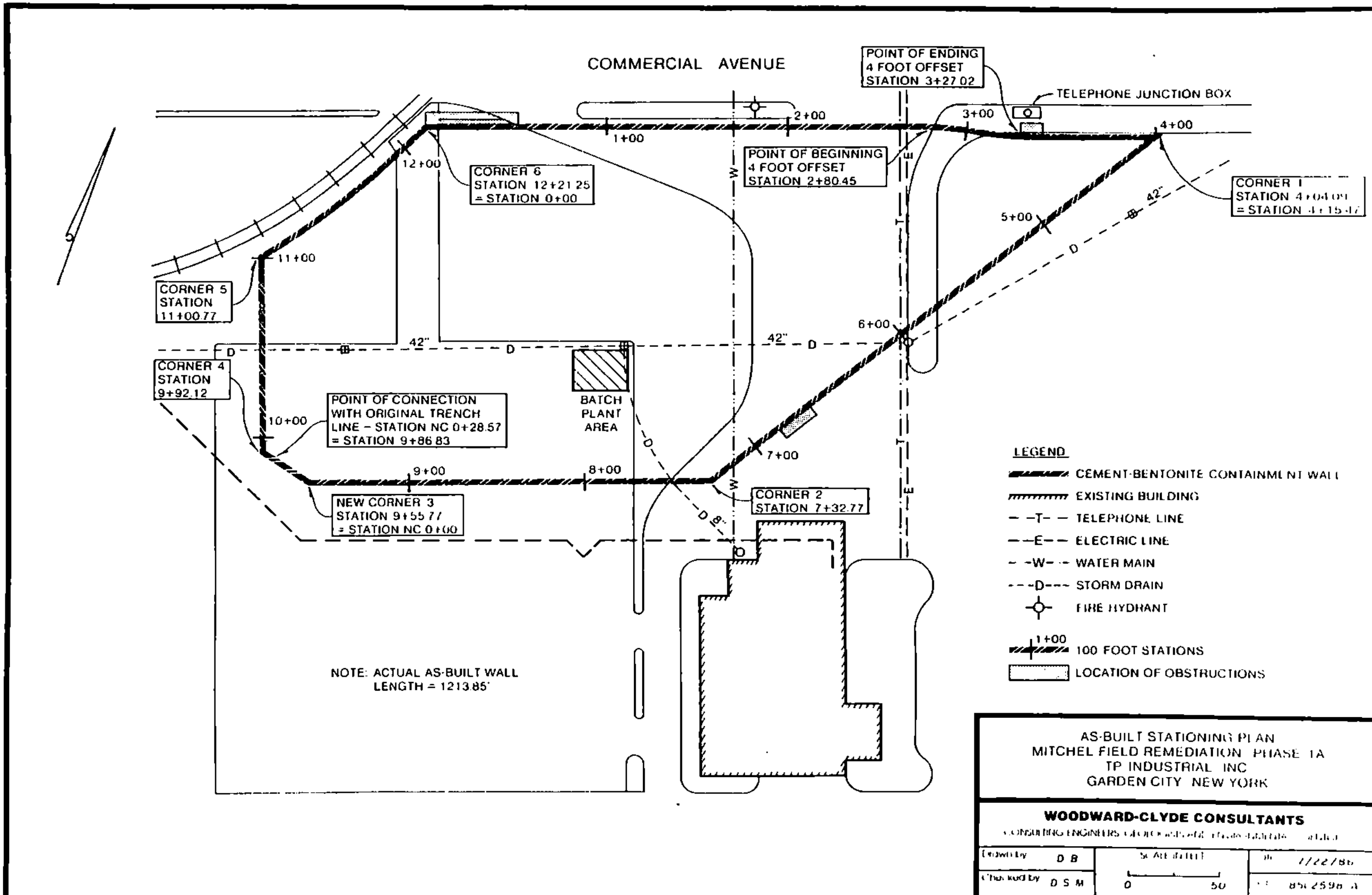
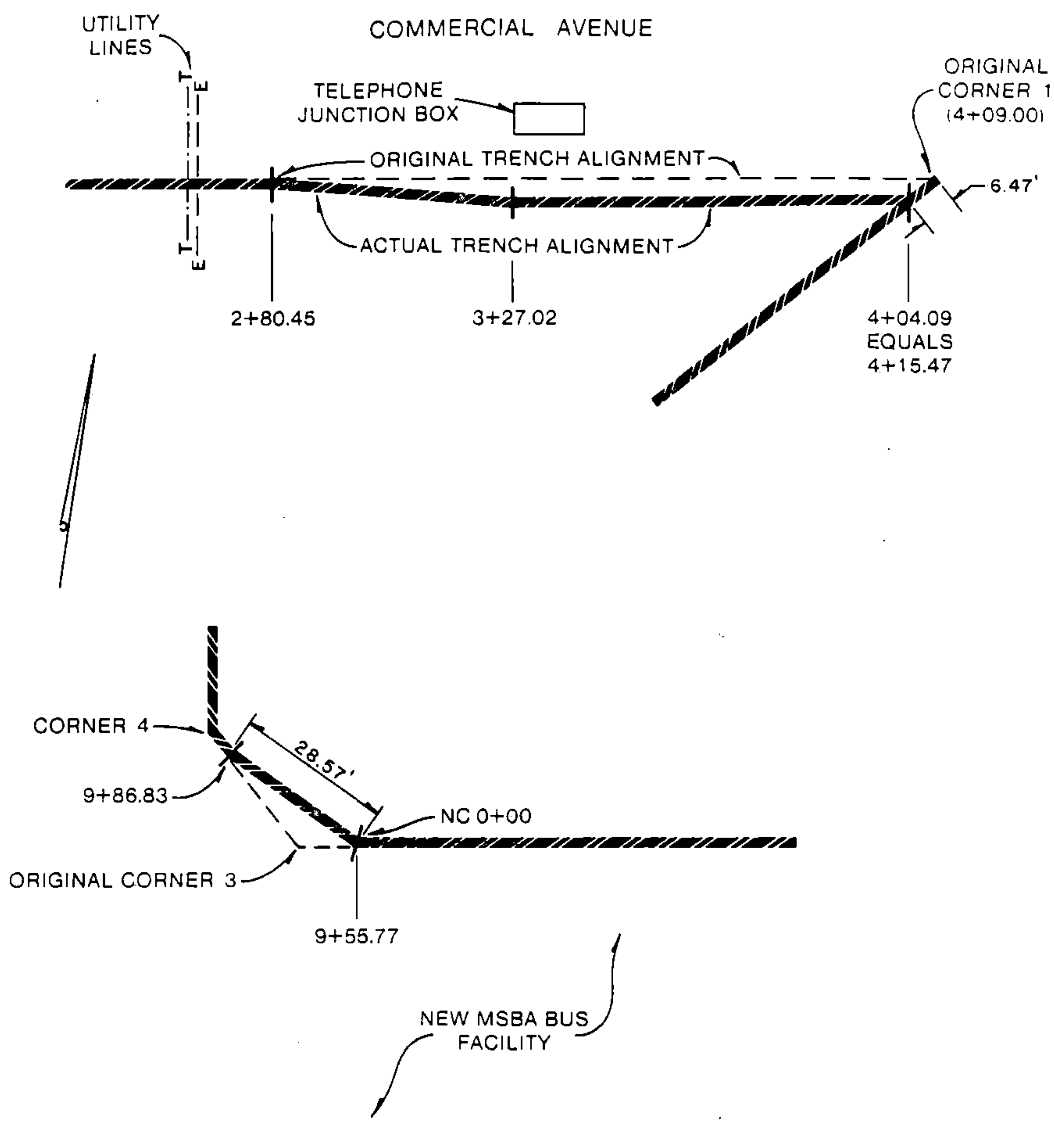
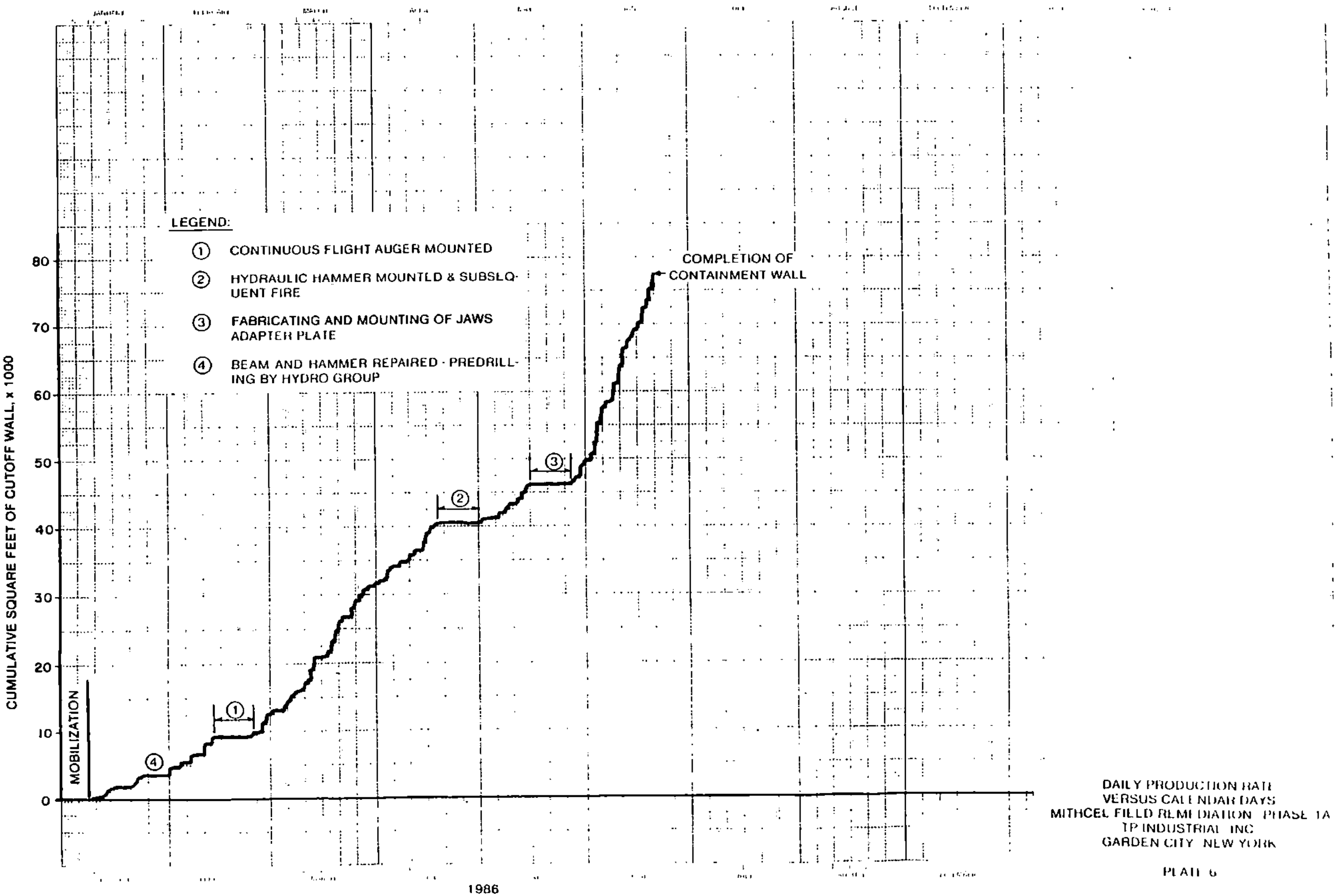

COMMERCIAL AVENUE
POINT OF ENDING
4 FOOT OFFSET
STATION 3+27.02
TELEPHONE JUNCTION BOX
1+00
2+00
3+00
4+00
5+00
6+00
7+00
8+00
9+00
10+00
11+00
12+00
CORNER 6
STATION 12+21.25
= STATION 0+00
POINT OF BEGINNING
4 FOOT OFFSET
STATION 2+80.45
CORNER 1
STATION 4+04
= STATION 4+15.47
42"
CORNER 5
STATION
11+00.77
CORNER 4
STATION
9+92.12
POINT OF CONNECTION
WITH ORIGINAL TRENCH
LINE – STATION NC 0+28.57
= STATION 9+86.83
BATCH
PLANT
AREA
NEW CORNER 3
STATION 9+55.77
= STATION NC 0+00
CORNER 2
STATION 7+32.77
8"
NOTE: ACTUAL AS-BUILT WALL
LENGTH = 1213.85'
LEGEND
CEMENT-BENTONITE CONTAINMENT WALL
EXISTING BUILDING
TELEPHONE LINE
ELECTRIC LINE
WATER MAIN
STORM DRAIN
FIRE HYDRANT
100 FOOT STATIONS
LOCATION OF OBSTRUCTIONS
AS-BUILT STATIONING PLAN
MITCHEL FIELD REMEDIATION PHASE 1A
TP INDUSTRIAL INC
GARDEN CITY NEW YORK
WOODWARD-CLYDE CONSULTANTS
Drawn by D B
Checked by D S M
0 50
7/22/86

PLATE 3

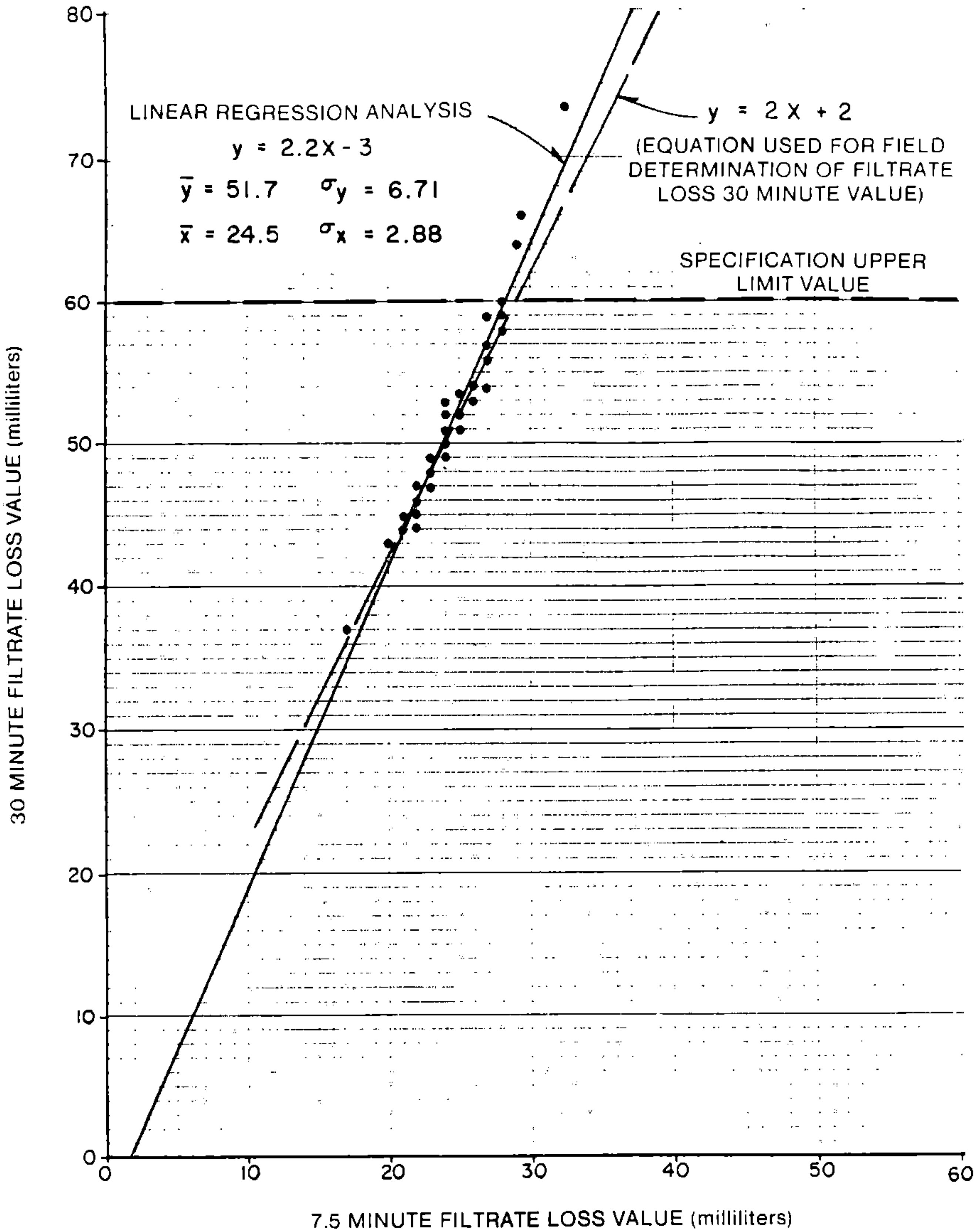


TRENCH REALIGNMENTS
STATION 2+80.45 AND STATION 9+55.77
MITCHEL FIELD REMEDIATION - PHASE 1A
TP INDUSTRIAL, INC.
GARDEN CITY, NEW YORK



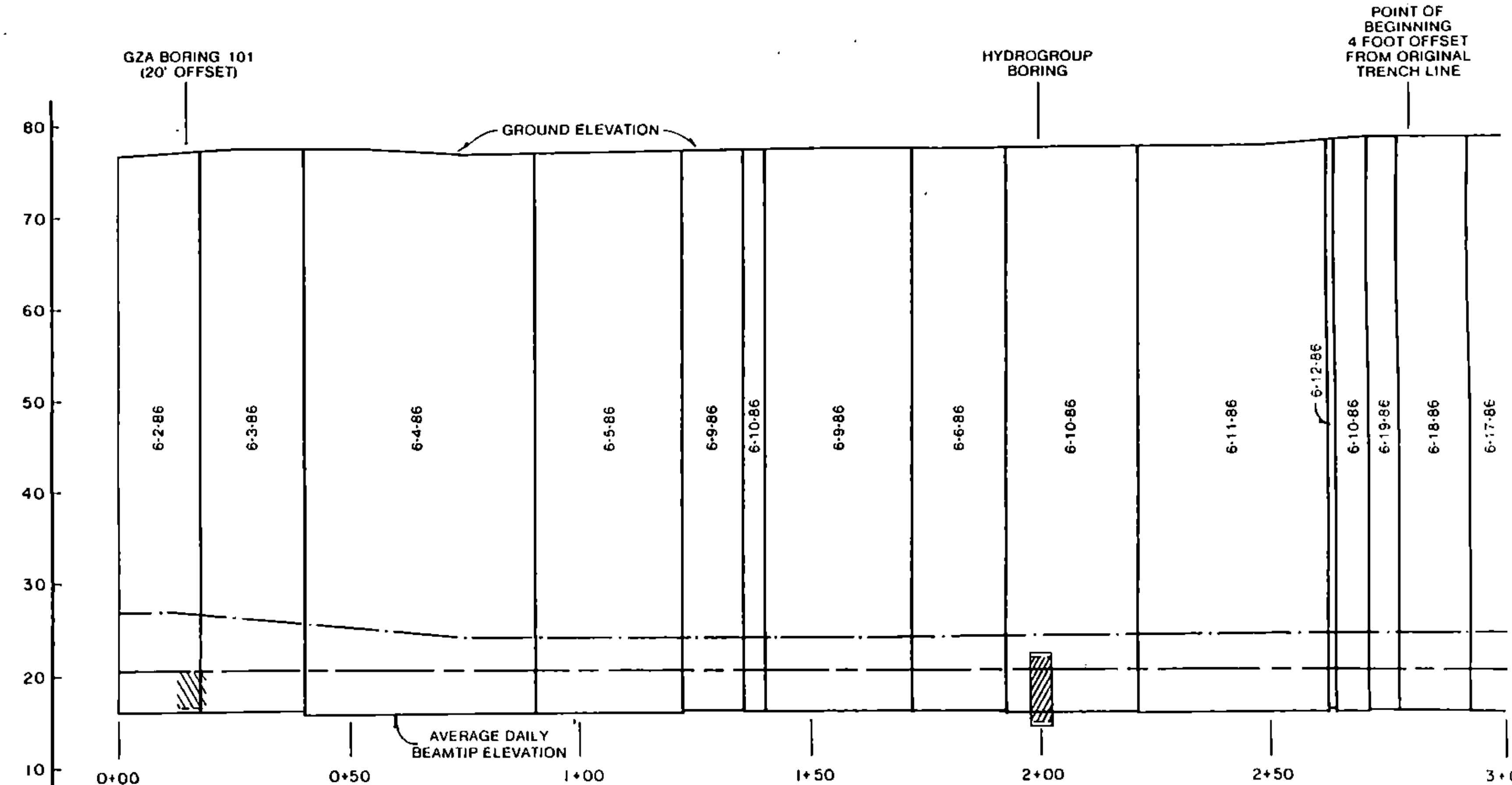
DAILY PRODUCTION RATE
VERSUS CALENDAR DAYS
MITHCEL FIELD REMEDIATION PHASE 1A
TP INDUSTRIAL INC
GARDEN CITY NEW YORK

PLATE 6



FILTRATE LOSS VALUE AT 7.5 MINUTES VS.
FILTRATE LOSS VALUE AT 30 MINUTES
MITHCEL FIELD REMEDIATION - PHASE 1A
TP INDUSTRIAL, INC.
GARDEN CITY, NEW YORK

PLATE 7



LEGEND

6-2-86	DATE SECTION COMPLETED
	HYDROGROUP BORING SAMPLING INTERVAL
	THICKNESS OF CLAYEY SILT LAYER FROM HYDROGROUP BORING
	THICKNESS OF CLAYEY SILT LAYER FROM GZA BORING
— · —	TOP OF MAGOTHY FORMATION
— — —	TOP OF MAGOTHY CLAYEY SILT

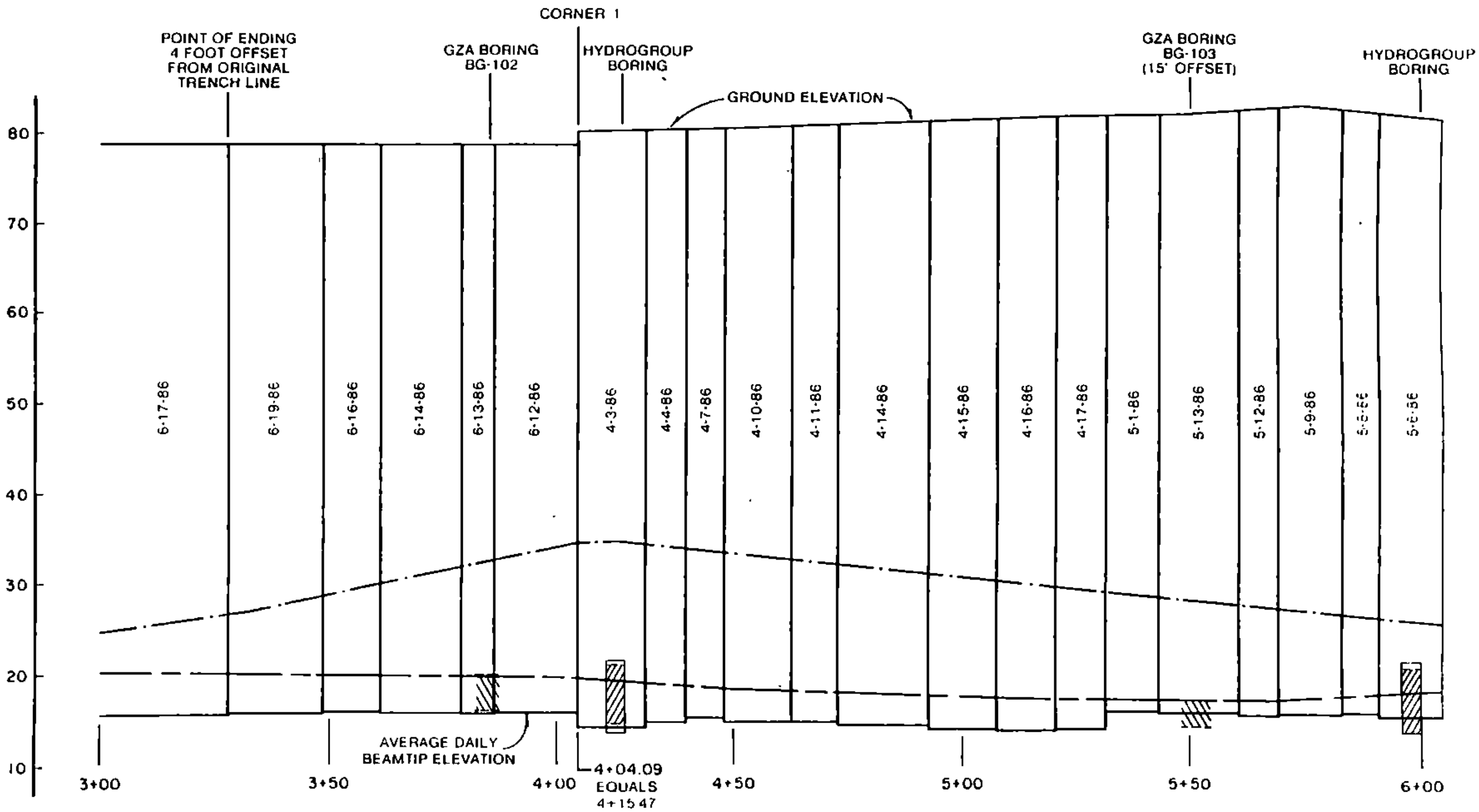
NOTES (FOR PLATES 8 - 11)

1. GZA BORINGS - BORINGS COMPLIED BY GOLDBERG-ZOINO ASSOCIATES.
2. HYDROGROUP BORING - BORINGS COMPLETED BY HYDROGROUP FOR THE PURPOSE OF KEY CONFORMATION.
3. TOP OF MAGOTHY CLAYEY SILT LAYER IS INFERRED FROM GZA BORINGS
4. TOP OF MAGOTHY FORMATION IS INFERRED FROM GZA AND WCC BORINGS

AS-BUILT PROFILE
STATION 0+00 TO STATION 3+00
MITCHEL FIELD REMEDIATION PHASE 1A
TP INDUSTRIAL INC
GARDEN CITY NEW YORK

WOODWARD-CLYDE CONSULTANTS

Drawn by	DB	SCALE	7/30/86
Checked by	DSM	0 20	85C2598-4



LEGEND.

6-2-86 DATE SECTION COMPLETED

HYDROGROUP BORING SAMPLING INTERVAL

THICKNESS OF CLAYEY SILT LAYER FROM HYDROGROUP BORING

THICKNESS OF CLAYEY SILT LAYER FROM GZA BORING

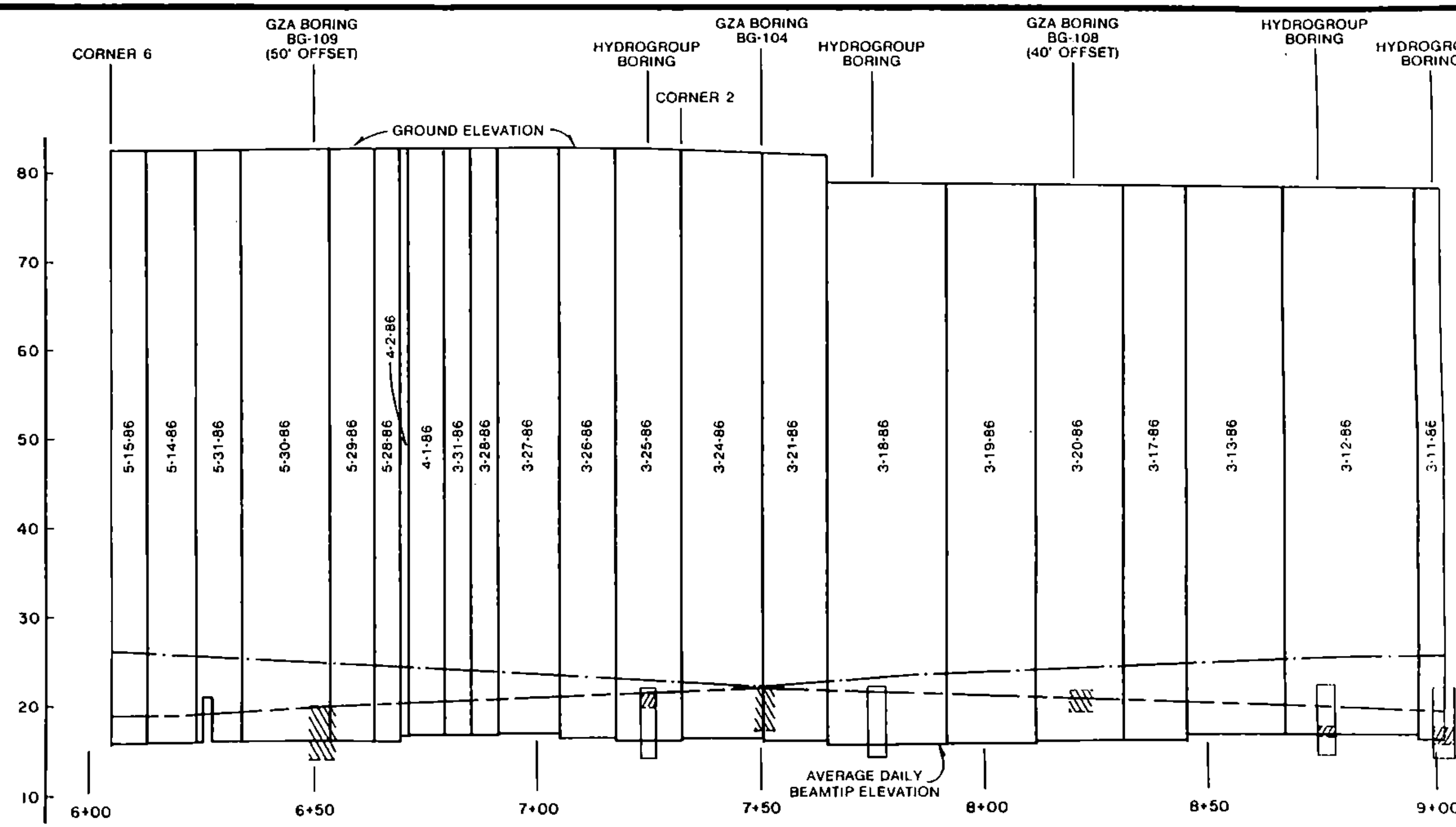
— · — TOP OF MAGOTHY FORMATION

— — — TOP OF MAGOTHY CLAYEY SILT

AS-BUILT PROFILE
STATION 3+00 TO STATION 6+04.66
MITCHEL FIELD REMEDIATION PHASE 1A
TP INDUSTRIAL INC
GARDEN CITY NEW YORK

WOODWARD-CLYDE CONSULTANTS

Drawn by	D B	SCALE (FEET)	7/30/86
Checked by	D S M	0 20	8502598 A



LEGEND

6-2-86 DATE SECTION COMPLETED

HYDROGROUP BORING SAMPLING INTERVAL

THICKNESS OF CLAYEY SILT LAYER FROM HYDROGROUP BORING

THICKNESS OF CLAYEY SILT LAYER FROM GZA BORING

— · — TOP OF MAGOTHY FORMATION

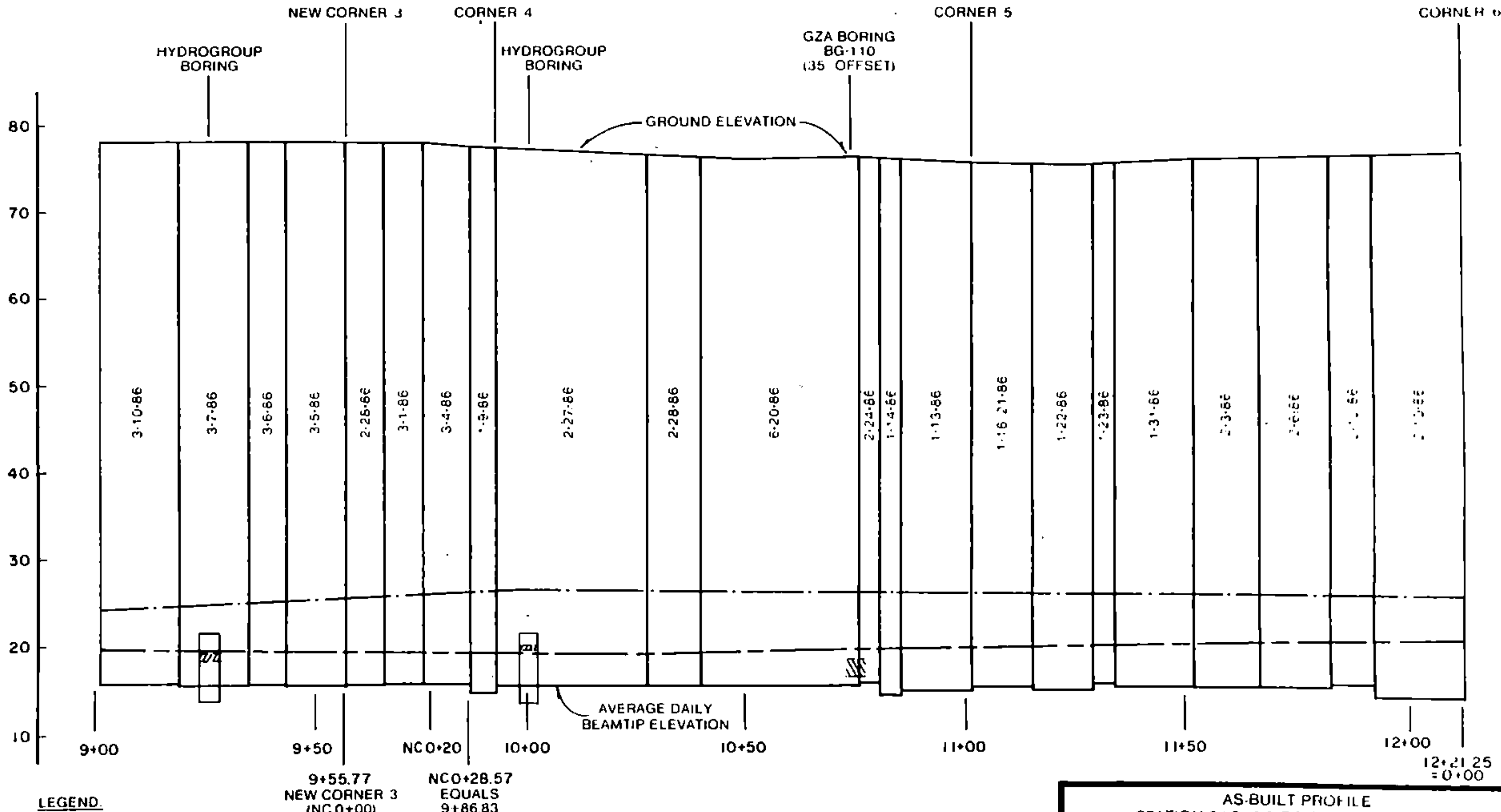
— — — TOP OF MAGOTHY CLAYEY SILT

AS-BUILT PROFILE
STATION 6+04.66 TO STATION 9+01.32
MITCHEL FIELD REMEDIATION PHASE 1A
TP INDUSTRIAL, INC
GARDEN CITY NEW YORK

WOODWARD-CLYDE CONSULTANTS

Drawn by D.B.	SCALE IN FEET 0 20	Date 7/30/86
Checked by D.S.M		8502598 A

PLATE 6



LEGEND:

6-2-86 DATE SECTION COMPLETED

HYDROGROUP BORING SAMPLING INTERVAL

THICKNESS OF CLAYEY SILT LAYER FROM HYDROGROUP BORING

THICKNESS OF CLAYEY SILT LAYER FROM GZA BORING

—·— TOP OF MAGOTHY FORMATION

— — — TOP OF MAGOTHY CLAYEY SILT

AS-BUILT PROFILE
STATION 9+01.32 TO STATION 12+21.25
MITCHEL FIELD REMEDIATION PHASE IA
TP INDUSTRIAL INC
GARDEN CITY NEW YORK

WOODWARD-CLYDE CONSULTANTS

Drawn by	D B	SCALE IN FEET	7/31/86
Checked by	D S M	0 20	8562598 A

PLATE 11

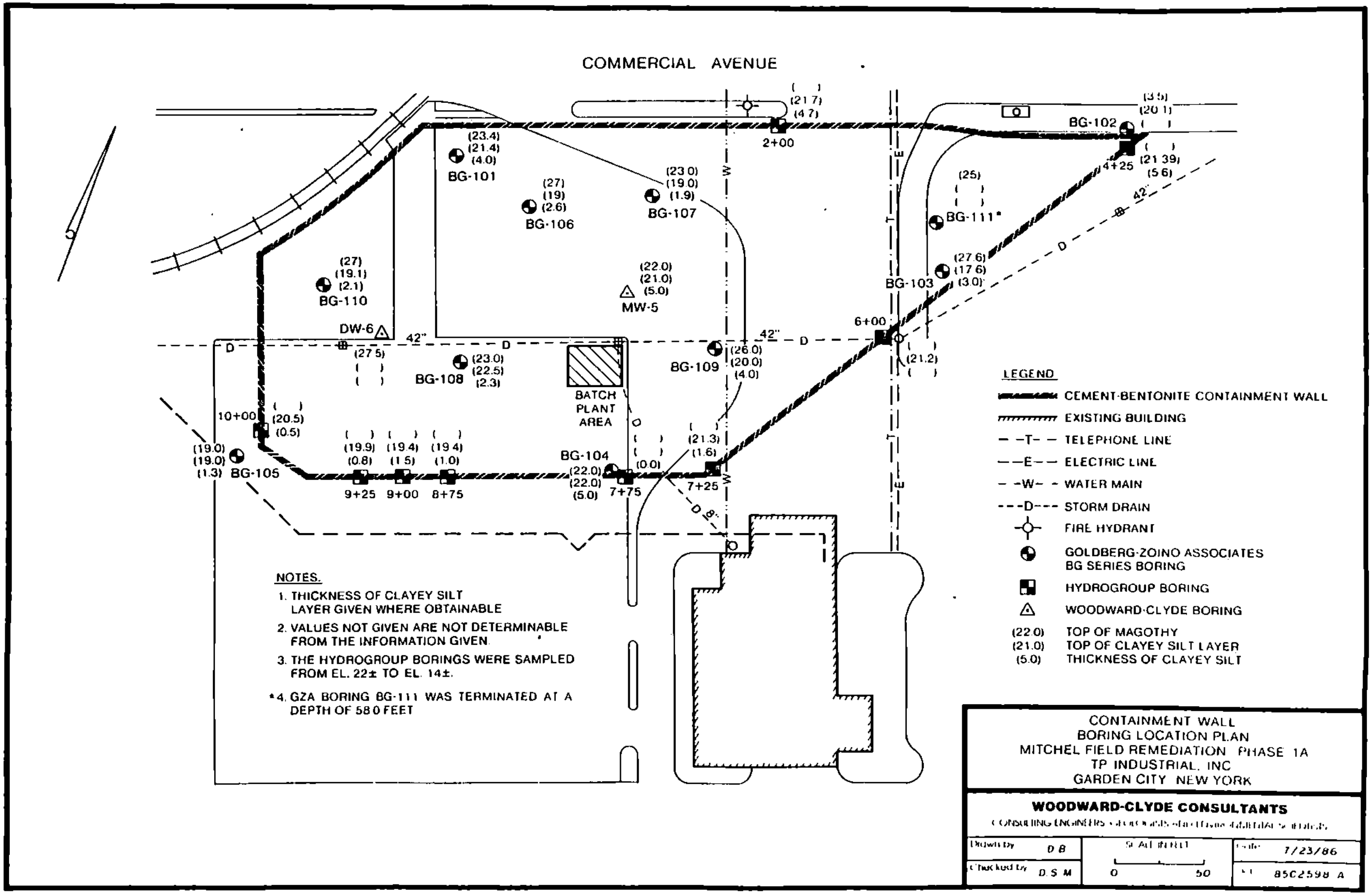
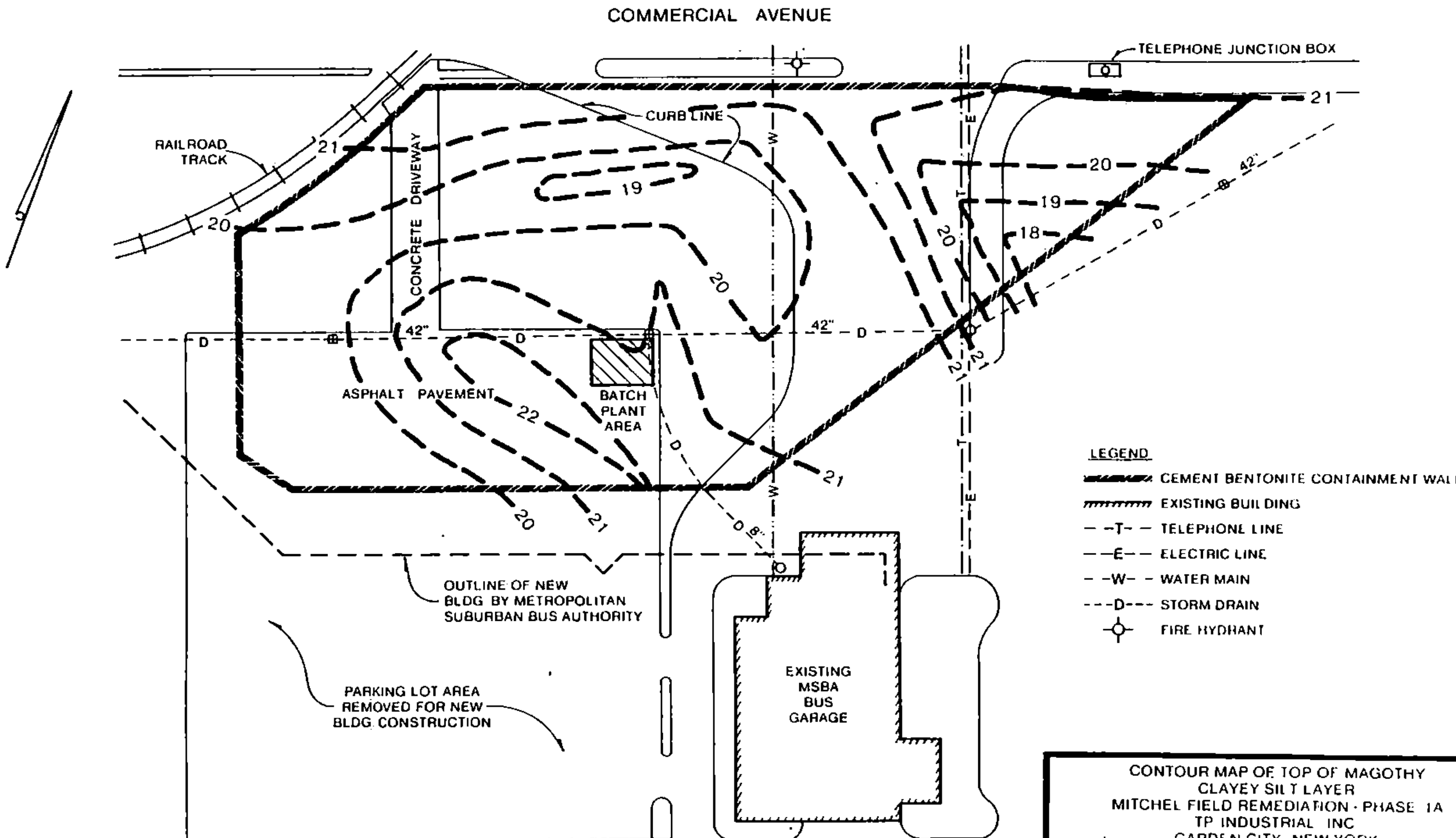

COMMERCIAL AVENUE
BG-101 (23.4) (21.4) (4.0)
BG-106 (27) (19) (2.6)
BG-107 (23.0) (19.0) (1.9)
2+00 (21.7) (4.7)
BG-102 (3.5) (20.1)
4+25 (21.39) (5.6)
BG-111* (25)
BG-103 (27.6) (17.6) (3.0)
42"
BG-110 (27) (19.1) (2.1)
MW-5 (22.0) (21.0) (5.0)
DW-6 (27.5)
BG-108 (23.0) (22.5) (2.3)
BATCH PLANT AREA
BG-109 (26.0) (20.0) (4.0)
6+00 (21.2)
10+00 (20.5) (0.5)
BG-105 (19.0) (19.0) (1.3)
9+25 (19.9) (0.8)
9+00 (19.4) (1.5)
8+75 (19.4) (1.0)
BG-104 (22.0) (22.0) (5.0)
7+75 (0.0)
7+25 (21.3) (1.6)
NOTES.
1. THICKNESS OF CLAYEY SILT LAYER GIVEN WHERE OBTAINABLE
2. VALUES NOT GIVEN ARE NOT DETERMINABLE FROM THE INFORMATION GIVEN.
3. THE HYDROGROUP BORINGS WERE SAMPLED FROM EL. 22± TO EL. 14±.
*4. GZA BORING BG-111 WAS TERMINATED AT A DEPTH OF 58.0 FEET
LEGEND
CEMENT-BENTONITE CONTAINMENT WALL
EXISTING BUILDING
T TELEPHONE LINE
E ELECTRIC LINE
W WATER MAIN
D STORM DRAIN
FIRE HYDRANT
GOLDBERG-ZOINO ASSOCIATES BG SERIES BORING
HYDROGROUP BORING
WOODWARD-CLYDE BORING
(22.0) TOP OF MAGOTHY
(21.0) TOP OF CLAYEY SILT LAYER
(5.0) THICKNESS OF CLAYEY SILT
CONTAINMENT WALL
BORING LOCATION PLAN
MITCHEL FIELD REMEDIATION PHASE 1A
TP INDUSTRIAL, INC
GARDEN CITY NEW YORK
WOODWARD-CLYDE CONSULTANTS
Drawn by D B
Checked by D.S.M
0 50
7/23/86
85C2598 A

PLATE 1



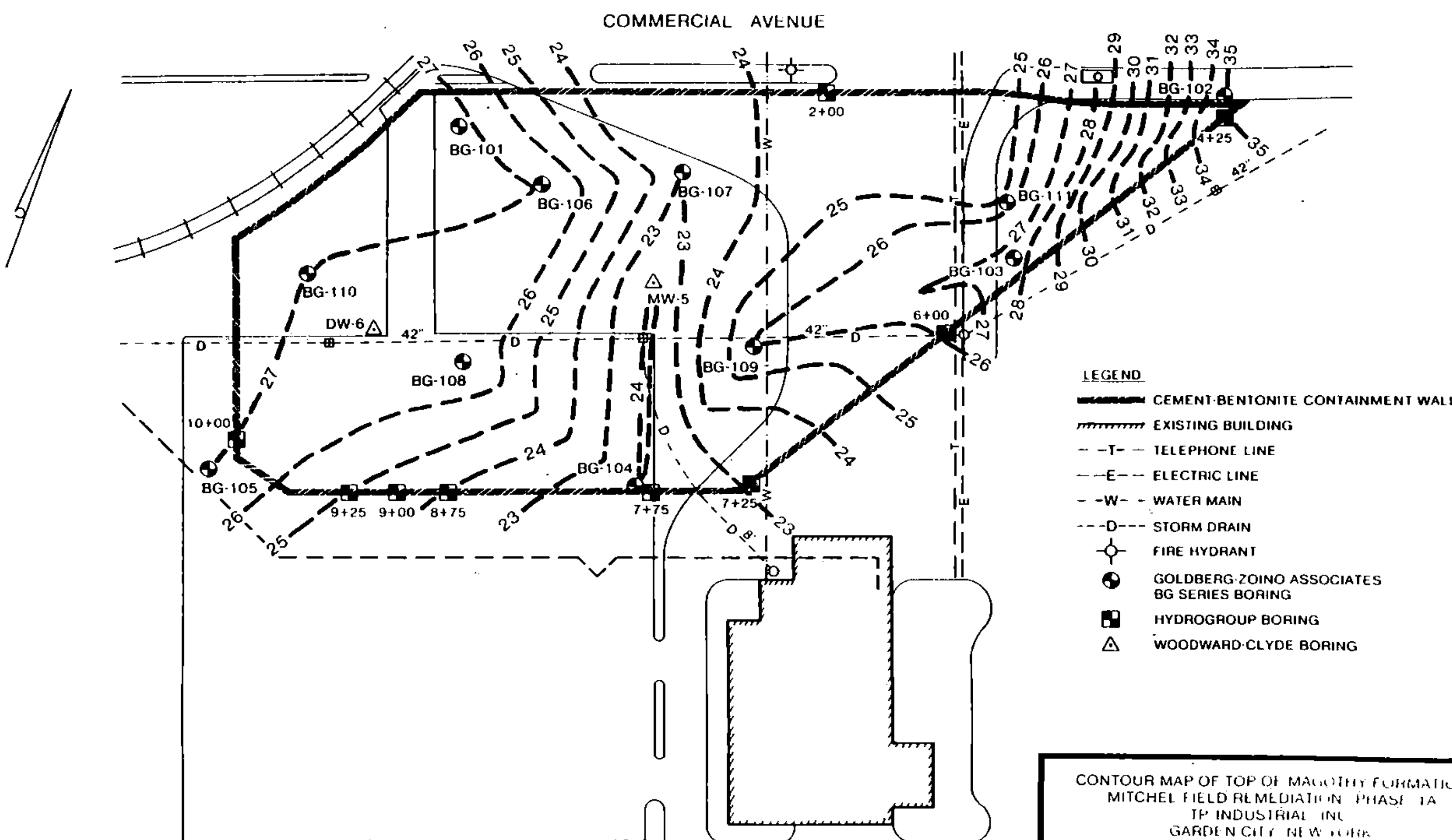
NOTE: CONTOURS INFERRED FROM TOP OF CLAYEY SILT ELEVATIONS SHOWN ON PLATE 12

CONTOUR MAP OF TOP OF MAGOTHY CLAYEY SILT LAYER
MITCHEL FIELD REMEDIATION - PHASE 1A
TP INDUSTRIAL INC
GARDEN CITY NEW YORK

WOODWARD-CLYDE CONSULTANTS

Drawn by D.B.	Scale in Feet 0 50		7/22/86
Checked by D.S.M			85C2598 A

PLATE 11



NOTE CONTOURS INFERRED FROM TOP OF MAGOTHY FORMATION ELEVATIONS SHOWN ON PLATE 12

CONTOUR MAP OF TOP OF MAGOTHY FORMATION
MITCHEL FIELD REMEDIATION PHASE IA
TP INDUSTRIAL INC
GARDEN CITY NEW YORK

WOODWARD-CLYDE CONSULTANTS

Drawn by D B	SCALE IN FEET		8/20/86
Checked by D S M	0	50	85C2598 A

PLATE 11

Appendix A

SECTION 02395

CONTAINMENT WALL

PART 1: GENERAL

1.01 SCOPE OF WORK

A Furnish all plant, labor, equipment, materials and incidentals, and perform all operations as required to construct a containment wall at the Mitchel Field Site in the Town of Hempstead, New York. Containment wall construction will be based on one of the following methods as specified herein:

1. Thin-Wall Installed With Vibrated Beam.

2. Soil/Bentonite Slurry Trench

3. Cement/Bentonite Slurry Trench

1.02 RELATED WORK NOT INCLUDED

A Earthwork is included in Section 02200.

B The Contractor shall refer to Bidding and Contract Requirements, Division 1 and other pertinent sections of these Specifications and the Contract Drawings for construction sequence and other requirements related to containment wall construction.

1.03 SITE RESTRICTIONS

A Construction of the containment wall will proceed concurrent with the construction of the new MSBA bus garage, limiting available on-site area for activities related to wall construction. Additionally, construction of the containment wall will be constrained as follows by existing site conditions. First, access must be maintained to the existing bus garage. The proposed wall alignment traverses the existing asphalt concrete driveway leading to the garage. During wall construction, measures shall be taken to allow undisrupted bus traffic over the containment/wall. These measures shall include the construction of temporary ramps or any other structures which bridge the containment/wall and are capable of supporting bus loads. Second, an existing railroad line which runs parallel to and within ten (10) feet of a 120-foot section of the proposed wall must remain operable. Therefore, a construction method providing for support of the track subgrade must be employed. Third, full access for the full width of Commercial Avenue shall be maintained throughout construction. Temporary closing of the south lane will not be allowed. As wall construction proceeds along Commercial Avenue, the Contractor shall conduct his work in such a way as to not block or otherwise infringe upon traffic in Commercial Avenue. The implications of these conditions are discussed in Parts 2 and 3.

1.04 SYSTEM DESCRIPTION

A The purpose of the containment wall is to hydrologically isolate a region of soil and groundwater known to be contaminated with organic chemicals. Once the wall is constructed, groundwater in the containment area will be extracted, treated to remove contaminants and reintroduced at the ground surface. The clean water will flush contaminants from the unsaturated zone and the cycle will be repeated. The wall shall have a sufficiently low permeability to effectively prevent groundwater flow into or out of the contained zone, and its performance shall not be impaired by chemical attack over the projected five year design life.

1.05 SUBMITTALS

A Bid Documents

1. The Contractor shall submit with the bid documents the following applicable items:

   a. Type of containment wall construction that bid is based on (thin-wall installed with vibrated beam soil/bentonite slurry trench, or cement/bentonite slurry trench)

   b. Contractor qualifications, including project descriptions.

   c. Superintendent qualifications.

   d. Qualifications of quality control testing supervisor.

   e. Brand of bentonite to be used, statement from supplier detailing its properties, composition, and the proposed bentonite slurry design mix.

   f. Method of determining actual beam vertical location for thin-wall containment wall.

   g. Quality control and quality assurance plans detailing proposed quality control procedures.

h. Warranties regarding quality of workmanship, materials, and long-term performance of the completed containment wall.

i. Contractor's proposed design backfill mix and mixing procedures for soil/bentonite or cement/bentonite.

j. Contractor's design grout mix for thin-wall containment walls.

k. Hydraulic conductivity test data and results of usage on other sites for grouts used in thin-wall containment walls (other than Slurry System's, Inc. Aspemix) or soil/bentonite or cement/bentonite backfill for use in slurry walls.

l. Construction sequence and stability computations for proposed containment wall installation adjacent to railroad tracks and Commercial Avenue.

B Construction

1. The Contractor shall submit the following during construction:

a. Construction data on containment wall, including wall alignment, depth of wall, and verticality (refer to Paragraph 1.07).

b. Quality control data on slurry (refer to Paragraph 3.04).

c. Quality control data on backfill mix (refer to Paragraph 3.04).

d. Quality control data on grout (for thin-wall containment wall; refer to Paragraph 3.04).

e. For thin-wall containment walls, the quantity of grout used for each 100-ft section of wall (refer to Paragraph 3.02).

f. For soil/bentonite containment walls, the quantity of dry bentonite and slurry used in the backfill per 100 ft of wall (refer to Paragraph 3.03).

1.06 DEFINITIONS

A The relevant terms used within this Section are defined as follows:

slurry trench - a continuous, vertically-sided trench excavated through soil and/or rock via slurry stabilization and backfilled with a mixture of soil/bentonite or cement/bentonite and additives as necessary to yield a homogeneous barrier of very low permeability.

thin-wall containment wall - a thin (< 12-in wide), very low permeability barrier composed of a grout constructed by insertion of a steel beam and subsequent injection of grout during withdrawal of the beam.

backfill - in relation to soil/bentonite slurry trenches, refers to a designed mixture of select soil, bentonite and additives mixed to a homogeneous consistency with very low permeability and placed within the excavated trench in a controlled manner so as to eliminate voids. For cement/bentonite walls, the slurry serves as the backfill once the cement sets.

grout - a stable asphalt emulsion or a cement/bentonite/flyash mixture injected during beam extraction to form a continuous, very low permeability membrane; used in thin-wall containment wall construction.

slurry - a stable, dispersed colloidal suspension of bentonite or cement/bentonite in water used to maintain trench stability during excavation of soil/bentonite or cement/bentonite walls, respectively.

bentonite - a very fine, naturally occurring sodium cation-based montmorillonite clay.

fines - as used in specifying backfill mixes, are those naturally occurring soil particles which pass through a Standard U.S. Number 200 sieve size. These soil particles may be plastic or nonplastic.

overburden - natural soils or fills which overlie the bottom aquiclude, including sands, gravels, silts, and boulders as defined herein, and any other materials encountered within the fill; these materials may be plastic or nonplastic.

bottom aquiclude - the naturally occurring soil below the overburden which provides the primary impermeable barrier to upward flow; the containment wall will penetrate the deposit; consists primarily of clayey silt and silty clay; thickness varies from less than 1 ft to approximately 5 ft based on soil borings.

silty fine sand - the naturally occuring relatively low permeability granular soil which exists below the bottom agriculde at depths up to 100 ft (a thin deposit of relatively higher permeability fine to medium sand separates the silty fine sand from the bottom aquiclude). The containment wall will key into the silty fine sand.

additives - those materials which may be added to the slurry, backfill, or grout to alter their physical and/or chemical properties

groundwater level - the elevation of the groundwater surface as observed in shallow observation wells.

1.07 QUALITY ASSURANCE

A General

1. The Contractor shall provide adequate measures to ensure that the slurry trench or thin-wall containment wall is constructed in a manner which satisfies the design requirements set forth in these Specifications. Quality control measures shall be implemented by the Contractor during the construction sequence to avoid defects in the finished product which would reduce the effectiveness of the barrier. These measures shall include checks on the excavation and backfilling procedures, barrier depths and alignment, barrier continuity, and testing of slurry, backfill, and/or grout as necessary to provide a product meeting these Specifications. The Contractor shall submit plans detailing proposed quality control procedures with the bid package. Also included shall be a quality assurance manual outlining in detail the quality assurance program.

2. Independent check testing may be performed by the Engineer during construction of the slurry trench or thin-wall containment wall. In addition, testing by the Engineer to assess the continuity and hydraulic conductivity of the completed slurry trench or thin wall containment wall may be executed at the Contractor's expense. To this end, an allowance of $50,000 should be

incorporated into the bid price for testing of the completed wall by the Engineer.

B Construction Survey

1. Prior to the start of wall construction, the Contractor shall lay out the centerline of the containment wall and a containment wall base line at a 20-ft offset from the wall centerline. The 20-ft offset baseline shall have grade and line stakes at 25-ft intervals. The Contractor shall then prepare and submit to the Engineer a plan showing existing grade along the wall centerline prior to any construction along the proposed wall. The accuracy of horizontal control shall be ± 0.1 ft and vertical control /+ 0.1 ft.

2. As construction of the wall proceeds, the Contractor shall submit as-built drawings indicating:

   a. Wall alignment indicating the centerline of the top of wall at 25-ft stations to an accuracy of ± 0.1 ft. For slurry trench containment walls, measurements shall be taken from the baseline to the backhoe stick or clam shell cable with excavation tool at the bottom of trench and the stick or cable centered in the top of the trench. For thin-wall containment walls, the measurement shall be taken to the beam at full insertion.

   b. Depth and bottom elevation of wall at 25 ft stations to an accuracy of ± 0.1 ft.

   c. Wall verticality to an accuracy of ± 0.25 percent of wall depth. For slurry trench containment walls, measurements shall be made at 25-ft intervals using a 4-ft long level placed on the backhoe stick or clam shell cable with excavating tool at bottom of trench and stick or cable centered in the top of trench. This measurement shall be made at the same location as wall alignment measurements. For thin-wall containment walls, verticality measurements shall be made at each beam insertion. Measurements shall be made to an accuracy of 0.25% of wall depth using a 4-ft level on the beam stick-up at full insertion. Additional requirements for beam overlap and continuity are detailed in Paragraph 3.02.

C Qualifications

1. The Contractor shall submit evidence that he is competent and experienced in thin-wall or slurry trench containment wall construction. This evidence shall consist of summaries of relevant experience which shall

include brief descriptions of projects completed or in progress which involve successful applications of slurry wall technology similar to those specified herein. Project descriptions shall include trench depths, containment wall lengths, backfill material, design permeability, mixing procedures, and characterizations of the contaminants involved, along with any quality control testing data employed to evaluate containment effectiveness. It should be noted that the Contractor's qualifications will be a critical element in the bid evaluation process and that experience on at least one wall similar to the Mitchel Field project shall be a prerequisite for bidding.

2. The Contractor shall have sufficient competent personnel on site at all times to carry out the operations specified, and such personnel shall be experienced in this type of construction. In particular, a full-time, experienced on-site superintendent, employed by the Contractor, shall be used to control the composition, mixing, placing, cleaning, and maintaining of all slurry, backfill, and/or grout mixtures. Also, the quality control testing supervisor employed by the Contractor shall be experienced in the type of testing described in Paragraph 3.04. Credentials of the site superintendent and quality control testing supervisor shall be submitted with the Bid Documents, including the number of similar walls completed, type of backfill, depth and area.

D Warranties

1. The Contractor is requested to provide warranties regarding the quality of his workmanship, materials, and the performance of the completed containment wall over the estimated five-year design life. Contingency plans describing the methods and means of repair should the wall fail to perform according to the conditions of the warranty within the warranty period should be included. Limitations of the Contractor's liabilities shall also be detailed in such a submittal. Warranties and limitations of liability will be taken into consideration in the evaluation of bids and shall be submitted as part of the bid package.

PART 2: PRODUCTS

2.01 MATERIALS

A Thin-Wall Containment Wall

1. Mixing water shall be free of deleterious substances that may adversely affect the properties of the grout. It is the responsibility of the Contractor to insure

that the grout produced from the mixing water employed shall meet the standards of this Specification.

2. Admixtures may be added to the grout to achieve proper pumpability and workability. Additives which increase the finished wall's long-term hydraulic conductivity above the limits set forth in these Specifications shall not be used.

3. Grout

   a. The grout used in the thin-wall containment wall shall be a stable, homogeneous asphalt emulsion or cement/bentonite/flyash based mix with a long-term hydraulic conductivity of less than 1 x 10-7 cm/sec. The cured grout shall remain plastic and flexible so as not to crack under strains associated with other construction activities or long term curing efforts. The long-term strain to failure of grout samples taken during injection and cured for thirty days at 70 deg. F and 100 percent humidity shall be greater than 5 percent under unconfined compression testing. The grout shall be resistant to chemical attack to the extent that the hydraulic conductivity of the mix is not increased beyond 1 x 10-7 cm/sec over the design life of the wall.

   b. Testing to verify that these requirements are met in the grout shall be performed by the Contractor as outlined in Paragraph 3.04.

   c. The only grout material acceptable without submission of testing data with the bid is Slurry System's, Inc. Aspemix. Other asphalt or cement/bentonite/flyash based mixes shall be evaluated by the Engineer with respect to acceptability on the basis of hydraulic conductivity testing and the results of usage on other sites. This information must be submitted with the Bid Documents. The Contractor shall submit his design mix (including Aspemix) with the Bid Documents. Grouts based solely on cement/bentonite mixtures shall not be used.

B Soil/Bentonite Containment Wall

1. The bentonite used in the slurry and backfill mixes shall be powdered, premium grade, sodium montmorillonite conforming to the applicable standards set forth in the American Petroleum Institute (API) Specification 13A and as specified herein. The bentonite shall be API grade with a minimum barrel yield of 91 barrels/ton. The Contractor shall furnish with his Bid Documents the

brand of bentonite to be used and a statement from the supplier detailing the properties and composition of the product. The necessary properties of the bentonite slurry and backfill introduced into the trench shall be as specified. The bentonite shall be of sufficient quality such that when mixed with soil, the resulting soil/bentonite backfill achieves a hydraulic conductivity less than or equal to 1 x 10-6 cm/sec with a slump of 4 to 6 in and a unit weight not less than 100 pounds per cubic foot (pcf). The bentonite shall also be resistant to chemical attack to the extent that the hydraulic conductivity of the soil/bentonite mix is not increased beyond 1 x 10-6 cm/sec over the design life of the wall.

2. Mixing water shall be free of deleterious substances that may adversely affect the properties of the bentonite. It is the responsibility of the Contractor to insure that the slurry and backfill produced from the mixing water employed shall meet the standards of this Specification.

3. Soil

   a. The soil used in making the soil/bentonite backfill shall be friable, and essentially free of roots, ice, snow, rubbish, organic soils, or other foreign matter which could be detrimental to the backfill mix. The soil used shall yield a reasonably well-graded soil/bentonite backfill which achieves a hydraulic conductivity less than or equal to 1 x 10-6 cm/sec with a slump of 4 to 6 in and a unit weight not less than 100 pounds per cubic foot (pcf). The soil/bentonite backfill shall also resist chemical attack to the extent that the hydraulic conductivity of the soil/bentonite mix is not increased beyond 1 x 10-6 cm/sec over the design life of the wall.

   b. Soils excavated from the trench may be used in the backfill if the resultant soil/bentonite mixture meets the gradation, density, slump, and hydraulic conductivity specifications contained herein. It should be noted that the in-situ soils contain significant levels of organic contaminants. Natural in-situ soils primarily consist of fine to medium and fine to coarse sands with 10 to 20 percent gravel sizes and less than 10 percent silt/clay sizes. An upper deposit of fill (fine to coarse sand with up to 50 percent silt/clay sizes) and lower deposits of clayey silt and silty fine sand (up to 30 percent silt/clay sizes) also will be encountered during trench excavation. Blending the on-site soils is expected to result in a mixture containing approximately 10 to 20 percent silt/clay sizes. The addition of bentonite and/or additional off-site fine-grained soil will be required to achieve a backfill with a maximum hydraulic conductivity of 1 x 10-6 cm/sec. Soils used as fine-grained borrow must contain at least 50 percent fines. No separate payment will be made for supplemental borrow material required to meet the backfill requirements specified herein. Thus, the cost of all borrow should be included in the Contractor's unit price for slurry trench containment wall construction.

4. Admixtures of the type used in the control of oil-field drilling muds such as softening agents, dispersants, retarders or plugging and bridging agents may be added to the water, slurry, and/or backfill to permit efficient use of bentonite and proper workability of the slurry and backfill. Admixtures which increase the finished wall's long-term hydraulic conductivity above limits set forth herein shall not be used.

5. The slurry introduced into the excavated trench shall be a stable, homogeneous colloidal suspension of bentonite and water (and additives). Prior to pumping into the trench, the slurry shall conform to the following requirements:

concentration of bentonite (by weight): not less than 3 percent

slurry density: unit weight = 1.03 gm/cc - 1.30 gm/cc

apparent viscosity: $\geq$ 15 centipoise or 40 sec-Marsh Funnel at 68 deg. F.

rate of filtrate loss: $\leq$ 30 cc in 30 minutes at 100 psi.

Testing to verify that these requirements are followed shall be performed by the Contractor as outlined in Paragraph 3.04 of this Section. The Contractor shall submit his design slurry mix, including the bentonite brand and grade to be employed, with the Bid Documents.

6. Backfill introduced into the trench shall be a stable, homogeneous mixture of soil, bentonite, water and additives. The resulting mix shall be reasonably well-graded, shall have a hydraulic conductivity less than or equal to 1 x 10-6 cm/sec, shall be resistant to increases in hydraulic conductivity above 1 x 10-6 cm/sec due to chemical attack, and shall conform to the following requirements:

backfill density: $\geq$ 100 pcf

slump: 4-6 inches
gradation: consistent with design mix

The gradation of the backfill design mix shall conform to the following requirements:

bentonite: Greater than 3 percent by dry weight

fines: greater than 15 percent and less than 50 percent by dry weight. The percentage fines includes the bentonite added to the mix

sand and gravel:

Sieve Size	Percent Fines by Weight
12-in	100
3-in	85-100
3/4-in	70-100
No. 4	50-90
No. 20	20-70
No. 60	15-60

Testing to verify that these requirements are met in the backfill shall be performed by the Contractor as outlined in Paragraph 3.04. It is emphasized that meeting the minimum gradation requirements alone may not be sufficient to obtain a hydraulic conductivity less than the specified 1 x 10-6 cm/sec. In particular, use of in-situ soils will incorporate organic contaminants into the backfill mix and may affect the swelling properties of the bentonite. The Contractor shall submit his design mix to the Engineer with the Bid Documents for review.

C Cement/Bentonite Containment Wall

1. The bentonite used in the slurry mix shall be a powdered premium grade sodium montmorillonite which conforms to the applicable standards set forth in the American Petroleum Institute (API) Specification 13A and specified herein. The bentonite shall be API grade with a minimum barrel yield of 91 barrels/ton. The Contractor shall furnish with his Bid Documents the brand of bentonite to be used and a statement from the supplier detailing the properties and composition of the product. The necessary properties of the bentonite slurry and backfill introduced into the trench shall be as specified. The bentonite shall be of sufficient quality such that when mixed with cement, the resulting cement/bentonite mix achieves a hydraulic conductivity

less than or equal to 1 x 10-6 cm/sec. The cement/bentonite mix shall also be resistant to chemical attack to the extent that the hydraulic conductivity of the mix is not increased beyond 1 x 10-6 cm/sec over the design life of the wall.

2. Mixing water shall be free of deleterious substances that may adversely affect the properties of the cement/bentonite slurry. It is the responsibility of the Contractor to insure that the slurry produced from the mixing water employed shall meet the standards of this Section.

3. The cement used in preparing the cement/bentonite slurry shall be a Portland Cement, Type II as per ASTM Standard Specification C150. When mixed with bentonite, the resulting cement/bentonite mixture shall achieve a hydraulic conductivity less than or equal to 1 x 10-6 cm/sec. The cement/bentonite mix shall also be resistant to chemical attack to the extent that the hydraulic conductivity of the mix is not increased beyond 1 x 10-6 cm/sec over the design life of the wall.

4. Admixtures of the type used in the control of oil-field drilling muds such as softening agents, dispersants, regarders or plugging or bridging agents may be added to the water or slurry to permit efficient use, proper workability and hydration of the slurry. Admixtures such as flyash and water reducing agents as are used in concrete mixes may also be added to the water or slurry to increase workability and reduced hydraulic conductivities. Admixtures which increase the finished wall's long-term hydraulic conductivity above limits set forth herein shall not be used.

5. Slurry

   a. Prior to adding cement, the bentonite slurry shall be a completely hydrated, stable, homogeneous colloidal suspension of bentonite and water (and additives). The bentonite slurry shall conform to the following requirements:

      concentration of bentonite (by weight): not less than 3 percent

      slurry density:unit weight = 1.03 gm/cc - 1.30 gm/cc

      apparent viscosity: $\geq$ 15 centipoise or 40 sec-Marsh Funnel at 68 deg. F.

      rate of filtrate loss: $\leq$ 30 cc in 30 minutes at 100 psi

Testing to verify that these requirements are followed shall be performed by the Contractor as outlined in Paragraph 3.04 of this Section. The Contractor shall submit his design bentonite slurry mix, including the bentonite brand and grade to be employed, with the Bid Documents.

b. After complete hydration of the bentonite slurry, Portland Cement, Type II shall be added at a minimum rate of 470 pounds of cement per cubic yard of slurry. The cement/bentonite slurry shall be mixed to a uniform consistency and stored under constant agitation until pumped into the trench. The density of the slurry shall not be less han 1.25 gm/cc as measured just prior to introduction into the trench. No slurry shall be made in the trench. Testing to demonstrate the required amount of cement (and additives if used) has been added to the slurry shall be performed by the Contractor as outlined in Paragraph 3.04 of this Section. The Contractor shall submit his design cement/bentonite mix and mixing procedures, including bentonite and cement brands and grades to be employed, and hydraulic conductivity test results indicating a hydraulic conductivity of less than 1 x 10-6 cm/sec with the Bid Documents.

c. The resulting cement/bentonite slurry shall attain a hydraulic conductivity less than or equal to 1 x 10-6 cm/sec in a period of time not greater than thirty days. The cured cement/bentonite slurry shall also remain plastic and flexible so as not to crack under strains associated with other construction activities or long term curing efforts.

d. It is emphasized that a combination of the minimum required cement and bentonite contents may yield a slurry which will not meet both the specified hydraulic conductivity and flexibility criteria. It is up to the Contractor to adjust his mix so as to attain the specified slurry backfill criteria.

D Containment Wall Cap

1. Sand and gravel for use in containment wall cap shall be graded within the following limits:

Sieve Size	Percent Finer by Weight
4-in	100
1/2-in	50 - 85
No. 4	40 - 75
No. 40	10 - 35

2. Filter fabric (for slurry trench wall cap) shall be Mirafi 600X or equal designed to withstand wheel loads of up to 20,000 lbs.

2.02 EQUIPMENT - THIN-WALL CONTAINMENT WALL

A The thin-wall containment wall shall be constructed using suitable equipment capable of attaining the required depth and continuity of the wall.

B The vibrated beam shall have a minimum web depth of 30-in and a flange width of at least 15-in. The beam shall have a web thickness of at least 4-in and a minimum flange thickness of 2-in over its bottom 3 ft. The beam shall be controlled by guide leads assuring plumbness in the vertical plane meeting criteria provided in Paragraph 3.02 of this Section. The beam shall be driven using a crane with vibratory driver capable of an insertion rate insuring maximum verticality and an extraction rate which insures proper grout placement. The grout batching plant shall include the necessary equipment including a mixer capable of continuously producing a homogeneous grout, pumps, valves, hoses, supply and storage tanks and lines and all other equipment as required to adequately supply grout to the beam. If an asphalt emulsion grout is used, heated storage and supply of the asphalt shall also be provided. Pumping equipment and supply lines shall be capable of supplying a continuous flow of grout to the tip of the beam at a pressure and rate insuring a continuous grout membrane not less than 4-in thick.

C Excavation of the containment wall cap shall be accomplished by use of suitable earth-moving equipment along the wall centerline to the limits shown on the Drawings.

2.03 EQUIPMENT - SOIL/BENTONITE CONTAINMENT WALL

A Trench Excavation

1. Excavation of the soil/bentonite slurry trench containment wall shall be accomplished by use of suitable earth-moving equipment or combination thereof such as a backhoe and/or clamshell such that the required width of trench can be carried to its final depth of cut continuously along the trench line. Special chopping, chiseling or other suitable equipment shall be used as necessary to satisfactorily accomplish the required excavation. The width of the excavating tool shall be equal to or greater than the specified width of the containment wall. Additional equipment such as air lift pumps and slurry desanders shall be used if required to clean the slurry and trench bottom in

accordance with the requirements of these Specifications.

B Slurry Batching Plant

1. The slurry batching plant shall include the necessary equipment including a mixer capable of continuously producing a colloidal suspension of bentonite in water, pumps, valves, hoses, supply lines, and all other equipment as required to adequately supply slurry to the trench. A storage pond, with a minimum capacity of 50,000 gallons, shall be provided to store initially mixed bentonite slurry to allow hydration and to serve as a reserve in cases where substantial slurry loss from the trench through underlying pervious zones or other reasons may occur. Pumping equipment shall be sized to allow rapid delivery of slurry to the trench in such cases to prevent loss of slurry head. The location of the batching plant and the storage pond shall be within the area so designated on the Drawings. The bentonite slurry shall be agitated or recirculated in the storage pond as required to allow complete hydration and maintain a homogeneous mix. All slurry for use in the trench shall be prepared using a suitable mixer. No slurry is to be made in the trench.

C Soil/Bentonite Backfill Mixing and Placement

1. Equipment for mixing and placing backfill shall consist of suitable earthmoving, grading, or mixing equipment, such as bulldozers, blade graders, power harrows, pug mills, or blenders that are capable of thoroughly mixing the backfill materials into a homogeneous paste having the required properties and of placing the material in the trench as hereinafter specified. Mixing shall be confined to areas so-designated on the contract drawings and will generally not be allowed adjacent to the trench. No separate payment will be made for transporting the soil/bentonite backfill from the mixing area to the trench. Thus, the cost of on-site hauling of soil/bentonite backfill shall be included in the Contractor's unit price for soil/bentonite slurry trench containment wall construction.

D Containment Wall Cap

1. Excavation of the cap shall be accomplished by use of suitable earth-moving equipment along the wall centerline to the limits shown on the Drawings.

2.04 EQUIPMENT - CEMENT/BENTONITE CONTAINMENT WALL

A Trench Excavation

1. Excavation of the cement/bentonite slurry trench containment wall shall be accomplished by use of suitable earth-moving equipment or combination thereof such as a backhoe and/or clamshell such that the required width of trench can be carried to its final depth of cut continuously along the trench line. Special chopping, chiseling or other suitable equipment shall be used as necessary to satisfactorily accomplish the required excavation. The width of the excavating tool shall be equal to or greater than the specified width of the containment wall. Additional equipment such as air lift pumps and slurry desanders shall be used if required to clean the slurry and trench bottom in accordance with the requirements of these Specifications.

B Slurry Batching Plant

1. The slurry batching plant shall include the necessary equipment including a mixer capable of continuously producing a colloidal suspension of cement/bentonite in water, pumps, valves, hoses, supply lines, and all other equipment as required to adequately supply slurry to the trench. A storage pond, with a minimum capacity of 50,000 gallons, shall be provided to store initially mixed bentonite slurry to allow hydration and to serve as a reserve in cases where substantial slurry loss from the trench through underlying pervious zones or other reasons may occur. Pumping equipment shall be sized to allow rapid delivery of slurry to the trench in such cases to prevent loss of slurry head. The location of the batching plant and the storage pond shall be within the area so designated on the Drawings. The bentonite slurry shall be agitated or recirculated in the storage pond as required to allow complete hydration and maintain a homogeneous mix. All slurry for use in the trench shall be prepared using a suitable mixer which is capable of adding cement to the bentonite slurry and providing a homogeneous colloidal mixture of cement/bentonite and water. No slurry is to be made in the trench.

C Containment Wall Cap

1. Excavation of the cap shall be accomplished by use of suitable earth-moving equipment along the wall centerline to the limits shown on the Drawings.

PART 3: EXECUTION

3.01 GENERAL

A The intent of these Specifications is to produce a continuous, stable barrier to the lines and grades indicated on the Drawings and as specified herein. The containment wall shall be constructed by employing one of the following methods:

1. Thin-Wall Grout Containment Installed with Vibrated Beam.

2. Slurry Trench with Soil/Bentonite Backfill.

3. Slurry Trench with Cement/Bentonite Backfill

B The Contractor shall perform the work described in this Specification in a timely and workmanlike manner and without unnecessary delays. He shall have the necessary equipment and personnel on-site so that interruptions in the work are minimized. Included with the Bid Documents shall be a specific construction sequence for the section of wall adjacent to the railroad tracks with a plan for maintaining rail operation during construction. This shall address the issue of maintaining track support and shall be accompanied by engineering calculations pertaining to trench stability under lateral loads imposed by rail loadings. Also included with the Bid Documents shall be a specific construction sequence for the section of wall adjacent to Commercial Avenue with a plan for maintaining uninterrupted traffic and access over the full width of the roadway during wall construction. This shall address the issue of maintaining roadway support, particularly for the condition where the southern side of the road is lined with parked buses. Engineering calculations pertaining to trench stability under lateral loads imposed by bus loadings shall accompany this plan. The slurry trench or thin-wall containment wall shall be constructed to the elevations, lines and grades shown on the Drawings, and as specified herein, unless otherwise modified by the Engineer or his representative. Site conditions at the start of containment wall construction shall be as outlined in Paragraph 1.03 of this Section. The Contractor shall be responsible for any additional site grading required for wall construction.

3.02 INSTALLATION OF THIN-WALL CONTAINMENT WALL USING VIBRATED BEAM

A General Requirements

1. The impermeable "thin-wall" containment wall shall be installed using the "vibrated beam" technique. The barrier shall be constructed by inserting a modified wide-flange beam using vibratory methods through all overburden materials to elevation 5 unless otherwise directed by the Engineer. The beam shall be inserted vertically and grout pumped under pressure through grout pipes welded to the beam yielding a membrane in no case less than 4-in thick as shown on the Drawings. A check

on the minimum wall thickness shall be made by comparison of actual grout volume employed to theoretical volume for a wall of the specified dimensions. The Contractor shall compile and submit to the Engineer accurate records of the actual grout volume used for each 100-ft section of the wall. Verticality of the beam during and after insertion shall be maintained to within a tolerance that assures a minimum overlap of at least 3-in over the entire depth of the wall. This requirement applies both parallel and perpendicular to the plane of the wall; web overlap and flange overlap. The actual value of the percent verticality required depends on the width of the flanges used and the initial web overlap dimension. However, in no case shall the wall be allowed to deviate more than 1 percent from vertical without prior written approval by the Engineer.

2. The resulting barrier shall have an effective hydraulic conductivity of less than 1 x 10-7 cm/sec. All efforts shall be made to provide a continuous, homogeneous containment wall and the occurrence of material having a hydraulic conductivity greater than 1 x 10-7 cm/sec ("windows") shall not be allowed.

3. The thin-wall containment wall shall form a seepage barrier through an area known to be contaminated with organic chemicals which will be removed via a flushing process after containment wall construction. As it is anticipated that these contaminants will be in contact with the proposed thin-wall containment wall over the estimated five-year design life, the question of barrier deterioration must be addressed. The grout mix used shall be designed considering possible chemical degredation due to the various chemical constituents found in the soil and groundwater so as to maintain a hydraulic conductivity of less than 1 x 10-7 cm/sec over the design life of the barrier. The completed barrier shall not crack, shrink, or undergo other physical changes which may increase the hydraulic conductivity of the barrier to greater than 1 x 10-7 cm/sec over the five-year design life of the containment system.

B Construction of the thin-wall containment wall shall be performed as outlined in the following paragraphs:

1. Prior to starting wall construction by the vibrating beam method, the Contractor shall excavate a trench for alignment and holding excess grout materials along the centerline of the proposed wall as shown on the Drawings.

2. The Contractor shall construct the wall in a manner which insures a continuous barrier of the specified thickness and impermeability. The driving and extraction

of the beam shall be performed in a controlled manner with sufficient overlap of adjoining beams to prevent the occurrence of "windows" of untreated soil. The Contractor shall demonstrate to the satisfaction of the Engineer that there is positive grout flow at all times into the void left by the extracted beam. The minimum thickness of the resulting barrier shall be 4-in over the entire wall depth and at all overlap joints.

3. Beam penetration shall continue to elevation 5 at all points along the wall alignment as shown on the Drawings. However, the Contractor shall be prepared to go to greater depths to penetrate the bottom aquiclude and key a minimum of 5 ft into the underlying silty fine sand when directed by the Engineer. The bottom aquiclude shall be defined as the clayey silts and silty clays exhibiting fine grain size, uniformity, and low hydraulic conductivity as to act as a natural barrier to seepage, as determined by the Engineer. The purpose of keying into the silty fine sand below the bottom aquiclude is to engage an additinal deposit of relatively low permeability soil within the containment bottom where the bottom aquiclude is less than 1 ft thick. To evaluate whether the containment wall has penetrated the bottom aquiclude and keed into the silty fine sand, the Contractor shall take split spoon samples of the material below the bottom of the wall at fifteen foot intervals along the wall. The sampling spoon shall be attached to the guide fin welded to the beam. The Engineer shall determine whether the penetration is satisfactory based on the nature of the sampled soil. In addition, if the Contractor can provide evidence that the characteristic vibration of the beam clearly changes when the bottom aquiclude is entered, this method may also be used by the Engineer to determine whether the cutoff has penetrated the bottom aquiclude. Boulders may be encountered in the overburden materials and must be penetrated at no additional cost to the County. If the beam cannot penetrate to the specified bottom of wall elevation as shown on the Drawings, the Contractor shall provide other means of establishing the required barrier which are acceptable to the Engineer at no additional cost to the County. The Contractor shall provide a means acceptable to the Engineer for determining the depth of beam penetration along its centerline such as by markings on the beam.

4. Trench continuity to the full depth shall be assured by measurements of plumbness and depth of insertion. The Contractor shall be required to provide a positive method for determining actual beam vertical location both parallel and perpendicular to the plane of the wall to an accuracy of $\pm$1-in over the full length of beam for each insertion. The Contractor shall also perform the

required computations for each beam insertion to document actual beam overlap and thus, wall continuity. The Contractor's proposed method for determining beam overlap shall be submitted with the Bid Documents and will be evaluated as part of the selection process.

5. All grout for vibrating beam injection shall be mixed with equipment designed specifically for the grout type used. The grout mixing and pumping equiment shall be capable of continuously supplying a uniform, homogeneous grout, meeting the requirements specified herein, to the tip of the beam of a pressure up to 200 psi. The grout plant shall contain all necessary equipment to produce a uniform grout including: sumps, pumps, valves, hoses, supply lines, small tools, and all other equipment as may be required to adequately supply grout to the beam during installation and extraction.

6. Excess grout materials shall be disposed of in accordance with Section 01035 unless otherwise directed by the Engineer.

3.03 CONTAINMENT WALL CONSTRUCTION BY SLURRY TRENCH METHOD

A General Requirements

1. The trench shall have essentially vertical walls and a minimum width of 30-in and shall extend through all overburden materials to elevation 5 unless otherwise directed by the Engineer. The resulting barrier shall have an effective hydraulic conductivity of less than 1 x 10-6 cm/sec. All efforts shall be made to provide a continuous, homogeneous mixture of soil/bentonite or cement/bentonite within the trench, and the occurrence of material having a hydraulic conductivity greater than 1 x 10-6 cm/sec ("windows") shall not be allowed. The following sections outline minimum requirements deemed necessary by the Engineer to construct the containment wall. Adherence to minimum requirements specified herein does not necessarily result in an adequate containment wall with a hydraulic conductivity less than 1 x 10-6 cm/sec in all cases. The Contractor shall exceed minimum requirements as necessary to meet the performance requirements specified herein.

2. The containment wall shall form a seepage barrier through an area known to be contaminated with organic chemicals which will be removed via a flushing process after containment wall construction. As it is anticipated that these contaminants will be in contact with the proposed barrier over the estimated five year design life, the question of barrier deterioration must be addressed. The backfill material used (i.e., soil/bentonite or cement/bentonite, water, and

additives) shall be designed considering possible chemical degradation due to the presence of chemical constituents found in the soil and groundwater so as to maintain a hydraulic conductivity of less than 1 x 10-6 cm/sec over the design life of the barrier. The completed slurry trench containment wall shall not crack, shrink, or undergo other physical changes which may increase the hydraulic conductivity of the barrier to greater than 1 x 10-6 cm/sec over the 5-year design life of the containment system.

B Excavation of the slurry trench shall be performed as outlined in the following Paragraphs.

1. The Contractor shall excavate the slurry trench in a continuous manner, carrying the excavation to the full depth required at the point where work is started and carrying the required depth along the line of the trench. Excavation shall proceed continuously from the starting point to the finishing point. Slurry shall be introduced into the trench at the same time trenching is begun and shall be maintained in the trench during excavation and until backfilling. The Contractor shall maintain the stability of the excavated trench at all times for its full depth.

2. Bentonite or cement/bentonite slurry introduced into the trench shall be mixed and handled as outlined in Paragraph 2.01. Bentonite slurry may require cleaning to maintain a proper mix prior to backfilling. Soil excavated from the trench which is suitable for backfill shall be stockpiled in the areas so-designated for mixing backfill on by the Engineer for blending with borrow material and bentonite.

3. The excavation under slurry head shall be carried out in a manner which, when completed, provides a continuous 36-in wide trench to the required depth for the full width and length of the trench. The required trench depth shall be to elevation 5 as shown on the Drawings. However, the Contractor shall be prepared to go to greater depths to penetrate the bottom aquiclude and key a minimum of 5 ft into the underlying silty fine sand when directed by the Engineer. The bottom aquiclude shall be defined as the clayey silts and silty clays exhibiting fine grain size, uniformity, and low hydraulic conductivity as to act as a natural barrier to seepage, as determined by the Engineer. The purpose of keying into the silty fine sand below the bottom aquiclude is to engage an additional deposit of relatively low permeability soil within the containment bottom where the bottom aquiclude is less than 1 ft thick.

4. Boulders may be encountered within the fill and/or natural fill deposits on site and must be penetrated at no additional cost to the County.

5. The Contractor shall provide a suitable means for determining the depth of trench penetration at 25 ft intervals. Trench continuity to the full depth must be assured by such measurements taken just after excavation and through observation of the movement of excavating tools along the trench bottom.

6. Treatment of Trench Bottom

   a. The Contractor shall use such equipment and procedures as required to insure that a seal is formed between the bottom of the containment wall and the confining layer. The effective hydraulic conductivity of the seal as based on the minimum wall thickness specified shall be less than or equal to the hydraulic conductivity criterion for the wall.

   b. Low Permeability Soil Confining Layer

   The seal between the containment wall and the bottom aquiclude layer shall be formed by penetrating the bottom aquiclude and keying the wall into the underlying silty fine sand layer a minimum of 5 ft. The purpose of keying into the silty fine sand below the bottom aquiclude is to engage an additional deposit of relatively low permeability soil within the containment bottom where the bottom aquiclude is less than 1 ft thick. Immediately prior to placing backfill into a section of trench, the Contractor shall probe the trench bottom. Probing shall be done at 5-ft intervals for a distance of 50 ft just in front of the advancing backfill. Particular attention shall be exercised when probing immediately in front of the backfill face in recognition of the possibility that the advancing backfill may push and thus concentrate heavy slurry and/or sediment existing in the bottom of the trench. This material may "pile up" to the extent that the backfill can no longer displace it resulting in backfill overriding the "pile", thus causing a window. Backfill shall not be placed in a section of trench unless the trench bottom has been probed within the 2 hour period preceeding backfilling of that section. The Contractor shall provide probing tools and trench access acceptable to the Engineer to allow additional probing to be performed by the Engineer.

c. The bottom of trench elevation determined from probes shall be compared with elevations obtained just after excavation. The Contractor shall clean the trench bottom if a change in elevation or character indicates that material has collected in the key to a depth greater than 6-in as determined by the Engineer. Prior to backfilling the Contractor shall take all necessary measures to remove all sediment, sloughed material and/or unexcavated material from the key with the excavation tools or by other suitable means such as air lift or suction pumps; In addition, if the unit weight of the slurry in the trench exceeds the specified limits, or the mix becomes unworkable, the heavy slurry shall be removed from the trench by airlift, suction pump, clamshell, or other methods approved by the Engineer or the excess solids shall be removed from the slurry by screening or centrifugal-type desander.

d. As an alternative to bottom cleaning, the Contractor can overexcavate the key to increase its depth in anticipation of sedimentation. Overexcavation, in excess of the required key depth as determined by the Engineer, shall be at the Contractor's expense. Sediment shall be allowed to remain in that portion of the key below the required key. The Contractor is cautioned that overexcavation must account for possible concentration and piling up of sediment due to displacement by the advancing backfill. The probing requirement just prior to backfilling shall be enforced even if overexcavation is employed and any sediment found within the required key shall be removed.

7. Excess spoil from slurry trench excavations shall be disposed of in accordance with Section 01035 of these Specifications. Surplus bentonite or cement/bentonite slurry shall be disposed of in the same manner, unless otherwise directed by the Engineer.

C Slurry

1. Bentonite and/or cement/bentonite slurry for use in the trench shall be mixed in a high-speed continuous colloidal mixer capable of producing a homogeneous colloidal suspension of bentonite and/or cement and bentonite in water. The slurry plant shall include the appropriate mixing equipment and a mechanically agitated sump, pumps, valves, hoses, supply lines, and small tools, all as may be required to adequately mix and supply slurry to the trench. No slurry may be made in the trench. Mixing of water and bentonite shall continue until bentonite particles are fully hydrated and the resulting slurry is homogeneous. Storage containment

area(s) shall be provided to store initially mixed bentonite slurry to allow hydration time and to serve as a reserve in cases where substantial loss from the trench, through underlying pervious zones or other reasons, may occur. The slurry shall be agitated or recirculated in the storage pond as required to maintain slurry quality.

2. Slurry shall be introduced into the trench at the same time excavation is begun, and thereafter maintained at least 5 ft above groundwater level where possible, and shall not be permitted to drop to less than 2 ft above groundwater level nor more than 2 ft below the ground surface adjacent to the trench. The Contractor shall have personnel, equipment and materials available at all times (including weekends and holidays) to raise the slurry level and prevent trench sloughing.

3. For soil/bentonite backfilled walls, the Contractor shall be prepared to recirculate slurry within the trench and clean it of debris or sediment as necessary to achieve the desired density. In particular, slurry at the bottom of the trench may require recirculation and desanding prior to backfilling the trench with the soil/bentonite backfill.

4. Slurry, trench spoil, borrow, and dry bentonite shall be mixed and blended in mechanical blenders or by windrowing, bulldozing, blading or by other approved methods. Mixing and blending shall only be performed in areas specifically designated for mixing. Generally, mixing alongside the trench will not be permitted. Refer to Drawings for location of backfill mixing area. Mixing and blending shall be performed in such a manner as to produce the required properties of the backfill. The backfill material shall be thoroughly mixed into a homogeneous mass, free from lumps or pockets of bentonite, fines or sand and gravel greater than 3-in in diameter. Just prior to placement, the backfill material shall have a slump of 4 to 6 in. and a unit weight greater than 100 pcf. To this end, the materials shall be sluiced with slurry during blending operations. Sluicing with water shall not be permitted. The Contractor shall submit his mixing procedure with the Bid Documents. Accurate records of the amount of dry bentonite and slurry actually used in the backfill mix shall be tabulated per 100-ft of trench and submitted to the Engineer daily.

D Backfill

1. Dry bentonite shall be mixed with relatively dry off-site borrow using power harrows to obtain even and uniform dispersion of the bentonite prior to adding

trench spoil or slurry. This operation shall be performed far enough ahead of the application of trench spoil or slurry such that testing for the percent bentonite can be completed and more bentonite added, if required, prior to addition of spoil or slurry.

2. The backfill shall be placed continuously from the beginning of the trench, in the direction of the excavation, to the end of the trench. The toe of the slope of the trench excavation shall precede the toe of the backfill slope by not less than 50 ft, or as required to permit inspection and measurement. Placing operations shall proceed such that the surface of the backfill below the slurry shall follow a reasonably smooth grade and shall not have hollows which may trap pockets of slurry during subsequent backfilling. Free dropping of backfill material through the slurry will not be permitted. Initial backfill shall be placed by lowering it to the bottom of the trench with backhoe bucket, clamshell bucket, or tremie until the surface of the backfill rises above the surface of the slurry at the end of the trench. An acceptable substitute for the initial placing of backfill shall be to begin excavation on a 30 deg. angle (to the horizontal) proceeding to the bottom of the trench. Backfilling can be initiated by sloughing the backfill down the slope. Once the excavation has proceeded all the way around the wall and back to the starting point, the initial slope can be excavated and backfilled. Additional backfill may then be placed in such a manner that the backfill enters the trench behind the forward face of the previously placed backfill, thus advancing the existing face. To accomplish this, sufficient backfill shall be piled just behind the advancing backfill face to cause a slump and pushing action, thereby moving the face. The backfill shall not be dropped or deposited in any manner that will cause segregation. Other methods of advancing the face will be allowed only if it can be demonstrated that they produce a wall meeting the requirements specified herein as judged by the Engineer.

3. The Contractor shall record the elevation of the advancing front of the backfill at 10-ft intervals along the centerline of the containment wall at the beginning and end of each working day. These measurements shall be used to define the slope of the backfill. If at the start of a working day the measured slope does not match the slope recorded at the end of the previous working day, the areas where deviations occur shall be probed. Such deviations may result from material along the sidewalls of the trench caving in above the backfill. In this case, no additional backfill shall be placed until the material which has sloughed in above the backfill has been removed to at least the elevation of the

backfill as measured at the end of the previous working day. The Contractor shall excavate this material to the satisfaction of the Engineer. Excavation several feet into the previously placed backfill may be required to remove all of the sloughed material.

3.04 QUALITY CONTROL TESTING

A General

1. Tests shall be carried out by the Contractor as specified herein, and data sheets shall be maintained on a current basis on the job site. Quality control test results shall be made available to the Engineer at his request, and additional quality control testing shall be performed by the Contractor if the Engineer judges that test results performed previously are inadequate or yield data outside of values specified herein.

B Thin-Wall Containment Wall Grout Control Testing

1. Field control testing of the grout mix shall be performed by the Contractor at least four times per 8-hour work shift. Control testing will be developed based on the mix selected by the Contractor and approved by the Engineer.

2. In addition to field control testing, samples of the grout shall be obtained for every 100 cubic yards used and subjected to triaxial hydraulic conductivity and unconfined compression testing after a curing period of 30 days. These tests shall be run in accordance with the U.S. Army Corps of Engineers Manual Number EM1110-2 Appendix VII and ASTM D2166, respectively.

C Soil/Bentonite Containment Wall Control Testing

1. The type, frequency and acceptable values for soil/bentonite quality control tests are presented below and are summarized in Table 1:

   a. Testing of the bentonite slurry shall be performed prior to introduction into the trench at least once per 8-hour shift. Testing shall include the following:

      - unit weight
      - viscosity
      - filtrate loss

   b. Slurry from the bottom of the trench at the point of backfilling shall similarly be tested at the following intervals:

- unit weight — 1 test per 8-hour shift
- sand content — 1 test per 8-hour shift

c. The apparati necessary to obtain samples and perform these tests shall be supplied by the Contractor. The range of slurry properties deemed acceptable are outlined in Paragraph 2.01. More frequent testing shall be necessary if the slurry will remain in the trench for an extended period of time due to delays in backfilling, equipment breakdowns, or other interruption in the work.

2. Testing of backfilling shall be performed according to the following schedule:

- backfill slump: 1 test per 50 cubic yards of backfill
- backfill gradation: 1 test per 150 cubic yards of backfill
- backfill density: 1 test per 150 cubic yards of backfill
- triaxial hydraulic conductivity: 1 test per 1000 cubic yards

D Cement/Bentonite Containment Wall Control Testing

1. The type, frequency and acceptable values for cement/bentonite quality control tests are presented below and summarized in Table 2:

a. Testing of the bentonite slurry shall be performed just prior to mixing in the cement at least four times per eight-hour shift. Testing shall include:

- unit weight
- viscosity
- filtrate loss

b. Testing of the cement/bentonite slurry shall be performed just prior to introduction into the trench at least four times per eight-hour shift and at times corresponding to bentonite slurry testing. Testing shall include:

- unit weight
- water content

c. Samples of the cement/bentonite slurry shall be obtained from the trench just before the slurry sets to a point where sampling is no longer possible (as long as possible after excavation). One sample from the top 5 ft of the wall, one sample from the middle of the wall and one sample from the bottom 5 ft of the wall shall be obtained at 50 ft intervals along the wall. The sample size shall be large enough to fill eight 2-in diameter by 5-in high sample molds. Four such molds for each sample shall be filled and stored by the Contractor at 100 percent humidity at 70 deg. F. Samples shall also be taken for unit weight, water content, and sand content. Two samples per 1,000 cubic yards taken at the top and bottom of the trench shall be subjected to triaxial hydraulic conductivity and unconfined compression testing after a curing period of 30 days.

2. The testing apparati and personnel necessary to obtain samples and perform these tests shall be supplied by the Contractor. The range of slurry properties deemed acceptable are outlined in Paragraph 2.01.

3.05 HEALTH AND SAFETY CONSIDERATIONS

A The Contractor is responsible for health and safety protection for his personnel. The Contractor is referred to Section 01038 of this Specification for applicable health and safety guidelines.

B The Contractor shall be aware at all times that the on-site soils are contaminated with organic chemicals. Necessary precautions shall be taken to provide adequate protection for Contractor's personnel and others on site against contamination by direct contact with these soils.

C Air quality monitoring will be performed by the Engineer to measure the levels of contaminants in the air. This should be most critical during backfill mixing, and is of particular concern due to the urban environment in which the site is located. If measured, contaminant levels exceed those deemed safe, temporary work stoppage may result. This is discussed in Section 01038 of these Specifications.

3.06 SITE CLEANUP AND CONTAINMENT WALL PROTECTION

A After completion of slurry trench backfilling, all remaining excavated material and slurry shall be removed and the surface shall be cleaned and leveled as directed by the Engineer. No slurry shall be left in the storage pond and the pond shall be pumped dry and backfilled. If the slurry ponds are located within the area contained by the wall and the bottoms of the ponds are below elevation 76, the filter cake at the bottom of the pond must also be removed. Excess excavated soil and slurry shall be disposed of according to Section 01035 of this Specification.

B After completion of thin-wall containment wall installation, all remaining grout shall be removed and the surface shall be cleaned and leveled as directed by the Engineer. The grout shall be disposed of in accordance with Section 01035 of these Specifications.

C Cement/bentonite walls shall be kept moist by the Contractor during curing. The Contractor shall allow a minimum of 30 days or until the approval of the Engineer, whichever is greater, before placing the cap of sand and gravel over the containment wall.

D The top of the containment wall shall be protected by placing a sand and gravel cap over the wall as shown on the Drawings.

E Construction of the thin-wall containment wall cap shall be as follows:

1. Once the thin-wall containment wall is in place, excavate the key along the wall centerline as shown on the Drawings.

2. Place sand and gravel as specified in Paragraph 2.01D in the key to existing grade in lifts and compact each lift to 95 percent of maximum dry density as determined by ASTM Compaction Test, Designation D1557, Method D. A lift shall be defined as 6-in thick (loose-lift thickness) if compaction is by vibratory plate and 12-in thick (loose-lift thickness) if compaction is by vibratory drum. Minimum of 4 passes of the compaction equipment shall be made. The Contractor shall provide additional compaction and adjust the moisture content as necessary to achieve the required compaction.

F Construction of the slurry trench containment wall cap shall be as follows:

1. Once the slurry trench is in place and cured if necessary, excavate a key along the slurry trench centerline as shown on the Drawings and as follows:

   a. If existing grade is lower than the proposed final grade, the bottom of the key shall be 4-ft below existing grade.

   b. If existing grade is higher than the proposed final grade, the bottom of the key shall be 4-ft below final grade.

2. Place filter fabric as specified in the key.

3. Place sand and gravel as specified in Paragraph 2.01D in the key in lifts and compact each lift to 95 percent of maximum dry density as determined by ASTM Compaction Test, Designation D1557, Method D. A lift shall be defined as 6-in thick (loose-lift thickness) if compaction is by vibratory plate and 12-in thick (loose-lift thickness) if compaction is by vibratory drum. Minimum of 4 passes of the compaction equipment shall be made. The Contractor shall provide additional compaction and adjust the moisture content as necessary to achieve the required compaction.

4. Fold over one side of the filter fabric as shown on the Drawings.

5. Place and compact an additional 1-ft of sand and gravel as specified above.

6. Fold over the other side of the filter fabirc as shown on the Drawings.

7. Place and compact the final 1-ft of sand and gravel as specified above.

8. Filter fabric shall overlap a minimum of 4-ft perpendicular to the wall centerline and a minimum of 2-ft parallel to the wall centerline.

G The Contractor is liable for any damage to the completed slurry trench, or thin-wall containment wall incurred during construction or site cleanup activities. Any such damage shall be immediately repaired by the Contractor in a manner acceptable to the Engineer at no expense to the County.

Appendix B

QUALITY CONTROL PROGRAM

DIVISION I. CONTAINMENT WALL

1.0 PROJECT DESCRIPTION

1.1 Project Background

A Consent Decree has been signed which obligates TP Industrial, Inc. (TP Industrial) to undertake the remediation of the Mitchel Field site in the town of Hempstead, Nassau County, New York. The site was initially occupied by a company engaged in the storage and recycling of industrial chemicals. Subsequently, the site was occupied by the Metropolitan Suburban Bus Authority, which operates a small maintenance and washing garage, but has plans for the construction of a larger bus maintenance facility on the site. The Consent Decree requires that the site soils and ground water be remediated according to prepared plans and specifications. This work includes the installation of a containment wall to restrict the migration of chemical constituents in the subsurface, and to make more efficient the proposed flushing of the site soils to eliminate the source of chemical constituents contained therein.

1.2 Project Objectives

The objective of the project with respect to the containment wall is to install a continuous grout curtain around the site, which will extend to the depths indicated in the specifications and will hydraulically control the movement of ground water, containing identified chemical constituents, by restricting the horizontal permeability through the grout curtain to less than 1×10^{-7} cm/sec. The method selected to accomplish this objective employs the vibrating beam method (VBM) of slurry wall installation to alter the horizontal conductivity of in-situ soils. A grout slurry composed primarily of high-grade bentonite and cement will be utilized to provide the hydraulic barrier specified.

1.3 Reports

Upon the conclusion of the installation of the slurry wall, and after the testing and evaluation of samples has been completed, a report on the construction of the wall and drawings documenting the location and analytical results of quality control data and in-situ characteristics of the containment wall will be issued to TP Industrial for review.

2.0 QUALITY ASSURANCE OBJECTIVES

2.1 General

The quality of measurements made during the project will be determined by the following characteristics: representativeness, precision, accuracy, completeness, and comparability. Specific objectives for each characteristic are established to develop sampling and testing protocols, and identify applicable documentation. These objectives are established based upon site conditions, objectives of the project, and knowledge of available measurement systems. The subsequent use of the measurements and test results are also subject to aspects of the objectives set forth in this quality assurance program.

Canonie Construction Co., (Canonie), in conjunction with Slurry Systems, Inc., will, under the allowance provisions of the technical specifications, arrange for the collection of all samples and conduct all field measurements for the preparation, conduct, and analysis of the work. Sample collection and field handling will be in accordance with the sampling and sample handling protocols established in this program. Sample analysis for soil characteristics will occur on-site, as appropriate, or at an off-site soils laboratory. Field measurements will be supervised by Canonie.

2.2 Representativeness, Precision, Accuracy, Completeness, and Comparability

Measurements completed during the course of the work will be taken so that survey results are as representative of the actual field conditions as possible. Sampling protocols will be utilized to assure that the samples collected in the field are representative of the media present in the field. Sample handling protocols, including such tasks as storage, transportation, and preservation, will be used to protect the representativeness of the samples gathered during the project. Proper documentation in the field and in the laboratory will establish that protocols have been followed, and that sample identification as well as integrity have been preserved. Representativeness of samples will be assured by the collection of samples from each mix batch of slurry produced by the containment wall subcontractor.

Precision is the characteristic which reflects the ability to replicate a previously obtained value using identical test or measurement procedures, while accuracy is the characteristic which reflects the ability to obtain a value which equals, or approaches within certain pre-determined limits, the true value of a certain phenomenon. Each of these two characteristics are addressed in all data gathering and reporting conducted by Canonie. Data quality objectives for precision and accuracy are established for each of the major parameters to be measured or tested during the project. These objectives are based upon prior experience in executing remediation activities or construction activities similar to those required at the Mitchel Field site, on prior knowledge of the capabilities of the measurement or testing system to be employed during activity at the site, and on the limitations which are present in execution of the project. The precision and accuracy requirements for certain data gathering and reporting activities may vary based upon the anticipated use of the information. For example, the precision and accuracy requirements of data gathered to determine the quantity of grout (cubic yards) injected for every 10 lineal feet of wall installed will not be as strict as the precision and accuracy of data gathered to determine the in-situ permeability of the grout injected into the soil to form the containment curtain.

In general, horizontal alignment of the installed containment wall will be determined every 25 feet, utilizing survey staking set prior to the initiation of actual construction. Horizontal alignment will be checked on a random basis at locations intermediate to the 25-foot stations if deemed necessary by on-site supervisory personnel and TP Industrial representative. The horizontal alignment of the wall shall be within ± 0.1 feet of the control points positioned every 25 feet on the proposed line of the wall. Wall alignment, in terms of verticality, will be measured at least every 25 feet, and usually as often as possible. Wall verticality shall be maintained plumb on both axes to an accuracy of 1.0 percent of total wall depth. The depth of penetration of the vibrating beam shall be measured each time the beam is driven, with measurements taken to the nearest 0.1 feet. At a minimum, Canonie will obtain the elevation of the beam tip, prior to withdrawal, using an engineer's level.

The characteristic of completeness is a measure of the amount of valid data obtained compared to the amount that was specified to be obtained under normal conditions. The amount of valid data specified is established based on the measurements required to accomplish project objectives. The extent of completeness must be reviewed on a relative basis for sample collection, testing, and measurement activities, since the amount of valid data anticipated prior to data collection activities may not accurately define the amount of data necessary to render a correct decision about the current activities of the project. Therefore, on-site personnel for Canonie will maintain testing and data collection on a daily basis, and review the information collected, with TP Industrial's on-site representative so that a timely decision may be made whether to alter the type and/or quantity of data being collected to produce the required project documentation.

The characteristic of comparability reflects both the internal consistency of data collected with regard to a single parameter and an expression of data in units which are consistent with the units which data, gathered by other organizations measuring the same parameter, are presented. Comparability of data gathering and measuring procedures should also be addressed if data is to be reliably compared. Thus, the characteristic of comparability implies that the personnel involved in data acquisition and reduction must operate measurements systems within the calibrated range of the particular instrument as well as utilize analytical and data gathering methodologies which produce comparable results. In order that data gathered from the activities of the containment wall installation may be reliably compared, sampling and data gathering protocols, outlined in this program, shall be followed by all personnel at all times. When the county or engineer seek samples of the grout mixture being injected to form the containment wall, those samples will be obtained by inspection personnel in a manner consistent with sampling protocols currently in use and specified by this plan. Where measurements are being sought, inspection personnel will assist in the taking of the measurements in order that methodologies of measurement may be observed and procedures which may result in significant deviations are noted.

2.3 Objectives

The quality control objectives relating to the installation of the containment wall at the Mitchel Field site include the following:

To produce documented, traceable, and consistent data on the installation of the wall and the grout utilized in the construction thereof;

To collect sufficient field data and samples as well as duplicate samples to allow for assessment of sample representativeness and sample collection protocol precision;

To collect sufficient split-spoon samples to confirm that the containment wall has been adequately keyed into the bottom aquiclude/upper Magothy formation);

To collect sufficient measurements to provide for an accurate assessment of the placement of the containment wall in relation to the technical requirements;

To collect and analyze sufficient samples to determine the hydraulic conductivity of the containment wall using the constant head triaxial method;

To produce documented, consistent, and technically defensible data and reports which will indicate that the containment wall installed at the Mitchel Field site complies with the requirements of the Consent Decree.

3.0 EQUIPMENT AND MATERIALS

3.1 Equipment

The containment wall shall be constructed utilizing suitable equipment capable of attaining the required depths and wall continuity. Equipment shall be in good operating condition, and shall meet all applicable safety standards.

The vibrating beam utilized for the containment wall installation shall have a minimum web length of 30 inches and a minimum flange width of at least 15 inches. The beam shall have a built up web thickness of at least 4 inches, and a minimum flange thickness of 2 inches for the bottom 3 feet with adequate fin to maintain cutoff wall continuity. The beam shall be controlled by fixed guide leads that provide positive plumbness adjustment in both axes. This guide lead set-up shall be capable of providing vibrating beam insertions with a maximum deviation of 1 percent from vertical and with a minimum overlap of 3 inches with the pervious insertion. The guide lead and beam arrangement shall be mounted on a crane, and shall be driven with a vibratory driver capable of an insertion rate insuring maximum verticality and an extraction rate that allows proper grout placement. The grout batching plant shall include mixers, pumps, valves, hoses, supply and storage tanks, and lines, and all other equipment as required. Pumping equipment and supply lines shall be capable of supplying a continuous flow of grout to the tip of the beam at a pressure and rate insuring a continuous grout membrane not less than 4 inches thick. A guide trench 18 inches deep and as wide as the beam will be excavated and filled with slurry prior to insertion of the vibrated beam. Excavation of containment wall cap shall be accomplished by use of suitable earth-moving equipment along the wall centerline to the limits shown on the drawings.

3.2 Materials

Bentonite used in the make-up of the grout for the containment wall shall be pulverized, natural Wyoming sodium-cation material conforming to API Standard 13A. The manufacturer's certification that the bentonite incorporated into the grout mix meets this specification shall be supplied to Canonie and TP Industrial for approval prior to construction, and for inclusion in the containment wall report.

Cement used in the make-up of the grout for the containment wall shall meet the requirements of ASTM C150 Type I cement. The manufacturer's certification that the cement incorporated into the grout mix meets this specification shall be supplied to Canonie and TP Industrial for approval prior to construction, and inclusion in the containment wall report.

Water used in the make-up of the grout mix, and for all cleaning of equipment, shall be clean, fresh, and free from oil and alkalines, organic matter, and all other deleterious substances which will have an adverse effect on the hydraulic conductivity or compressive strength of the completed wall.

The manufacturer's certification for all additives incorporated into the grout mix shall be supplied to Canonie and TP Industrial for approval prior to construction, and for inclusion in the containment wall report. Additives shall be brought to the job site in the manufacturer's containers, and shall be properly labeled as to contents with directions for proper mixing and the limitations under which the additives are available for inspection.

4.0 GROUT

4.1 Grout Design

The grout chosen for use in the installation of the Mitchel Field containment wall consists of a mixture of the following:

82.1 % water

6.5 percent by weight Baroid Premium Grade 200 Mesh Bentonite

11.0 percent by weight Portland Type I Cement

< 0.1 percent by weight Tamol (a dispersant)

< 0.1 percent by weight trisodium phosphate (a dispersant)

< 0.2 percent by weight soda ash (a water conditioner which aids in the hydration of the bentonite)

4.2 Grout Preparation

The grout shall be prepared in equipment designed especially for the preparation of the grout. All equipment and materials needed to provide grout to the injection system in an uninterrupted fashion shall be available to the work at all times. Sufficient supplies of materials, such as bentonite and cement, shall be stocked on-site so that delays in delivery of these materials does not delay or halt the installation of the containment wall.

The grout shall be prepared by the containment wall subcontractor in accordance with customary practice. In general, the bentonite shall be weighed and then mixed with the proper volume of water until the bentonite is thoroughly hydrated. OSDF centrifugal pump dispersant additives may be included in the mix at this time to aid in the hydration of the bentonite or to condition the water. The bentonite/water mixture shall be circulated by a centrifugal pump for approximately six minutes to accomplish the hydration of the bentonite and the thorough mixing of all materials added. The additives shall also be included in the mixture at this time to prevent the contamination of t entonite by cement. Next the cement shall be weighed and the full shall be circulated through the centrifugal pump for an additional three minutes to obtain a homogeneous mixture. In general, only two to three cubic yards of grout shall be mixed at one time so that acceptable pumpability and liquidity is maintained in the mix prior to injection in the wall. Grout which has not been placed within three hours of the completion of mixing shall be discarded off-site.

4.3 Grout Injection

The injection of the grout shall proceed during insertion of the vibrated beam to ease the penetration and provide the first pass of slurry saturation of the adjacent soil strata. After the beam has been vibrated down to the required bottom aquiclude (upper Magothy formation), the grout injection shall be continued in conjunction with the beam extraction, filling the void as the beam is withdrawn. This constitutes the second pass of slurry saturation, thus ensuring curtain wall continuity. Beam withdrawal shall proceed at a rate not greater than ten feet per minute. Bear withdrawal shall be determined by measuring the time taken to withdraw a specified length of the beam. Grout injection shall be continuous and at a constant flow rate, with pressure maintained at a level which does not produce "boiling" of the grout in the previously-placed, adjacent wall areas. Grout injection shall continue until the entire depth of the annular space created by the beam insertion is filled.

5.0 SAMPLING

5.1 Sampling Containers

Sampling containers for the collection of grout for testing for viscosity, unit weight, and filtrate loss shall consist of clean one-gallon metal paint cans with a volume of approximately one quart. These containers will provide easy filling and transferring of the grout without substantial separation of the grout mixture. Samples of grout for viscosity, unit weight, and filtrate loss will be collected from each slurry batch.

Sampling containers for the collection of grout for testing for hydraulic conductivity and compressive strength will be split barrel tubes which are filled with grout collected in large buckets. The split barrel tubes will provide an efficient means of removing the cured grout from the container when testing is required, while providing for proper shaping of the sample during the curing phase. Split barrel tubes for the unconfined compressive strength testing will be two inches in diameter and five inches in length. Split barrel tubes for triaxial hydraulic conductivity testing will be 2.8 inches in diameter and approximately 6 inches in length. Samples for unconfined compressive strength and permeability will be collected once per day.

Sampling containers for the retrieval of soil samples from beneath the containment wall will be brass tubes approximately one inch in diameter and four inches long. The brass tubes will have fitted plastic caps to retain the soil and will be labeled. The caps will be taped to the tube to prevent accidental loss of the sample due to the inadvertent handling of the tube.

5.2 Sampling Locations

Samples will be retrieved from the batch mix of grout by tapping into the injection feed line just after the mix tank. Samples will be collected in glass mason jars at this location and transported to the on-site laboratory area for analysis of viscosity, unit weight, and filtrate loss.

Samples will be retrieved from the grout exiting the injection nozzles on the end of the beam by allowing grout to flow out of the nozzles at a controlled rate. Samples collected from this location will be collected in a large bucket and then transferred to the split barrel tubes for testing of compressive strength and hydraulic conductivity. On a random basis, grout which has been released from the nozzles will be retrieved for analysis of viscosity, unit weight, and filtrate loss and compared with results obtained from samples taken from the mixer.

Samples of soil from the base of the containment wall will be retrieved using a standard 24-inch split-spoon attached to the fin of the vibrating beam to verify that the wall has been driven deep enough to contact the bottom aquiclude (upper Magothy formation). Samples of the soil beneath the wall will be retrieved every 15 feet along the length of the wall with 4-inch-long brass liner segments inside the split-spoon.

5.3 Sample Procedures

Samples of the soil beneath the containment wall will be retrieved by attaching a split-spoon sampler to the fin of the vibrating beam. As the beam is driven into the soil, the split-spoon will travel down through grout which has been placed in the annular space created by previous beam insertions. When the beam has reached the bottom elevation of the wall, the beam will be driven an additional 12 inches to "set" the split-spoon sampler into "undisturbed" soil. When the beam has been withdrawn, site personnel will detach the split-spoon from the fin and inspecting personnel will open the split-spoon and visually classify the soils, recording the time the sample was taken, the person classifying the soil, and the location from which the sample was taken. The brass tube containing a representative sample of the soils retrieved will be capped with tight fitting plastic caps and the caps taped to the tube. The tube will be marked with an appropriate sample number, and scored with station number, date, and depth retained for future reference. The sample number given to each brass tube soil sample will be recorded on a sample log together with the time the sample was taken and the location from which the sample was retrieved. This sample log shall remain in the permanent files of the project. Every fourth sample will be analyzed for particle size distribution using ASTM D-422.

Samples of the grout from the injection nozzles attached to the end of the beam will be taken by instructing the vibrating beam rig operator to release a small amount of grout into pre-cleaned buckets stationed below the beam. The grout collected will be taken to the on-site testing area and immediately transferred into the split barrel tubes reserved for hydraulic conductivity and compressive strength testing. The samples will be marked with a tag indicating the time and date the grout was collected and the location where the grout was placed in the wall. The samples will then be capped, and cured for a minimum of four days under controlled temperature and humidity conditions before shipment to the soils laboratory for hydraulic conductivity and unconfined compression analysis. Upon receipt of the samples at the laboratory, the analytical technician shall place the samples in an environment where the temperature is maintained at 70 degrees Fahrenheit and the humidity is maintained at 100 percent.

Samples collected for marsh funnel viscosity, filtrate loss, and unit weight testing will be collected in cleaned 1-quart metal paint cans. The grout collected will then be transferred to the on-site testing area and the samples tested. The samples will be collected by tapping into the grout feed line leading from the mix tank or storage tank to the vibrating beam rig. Approximately three quarts of grout will be withdrawn from the line and placed in the mason jars for transfer to the testing area. The time of collection of the grout and the location of the containment wall currently being installed will be noted on the sample log for each sample batch collected. This information, together with the name of the sampler and the results of the testing will be recorded and kept in the permanent file of the project.

5.4 Sample Custody and Handling

An established program of sample chain-of-custody procedures, that is followed during sample collection and handling activities in both the field and laboratory operations, will be instituted during the remediation activities associated with the Mitchel Field site. The program is designed to assure that each sample is accounted for at all times. To maintain the highest degree of control in sample handling for the remediation of the Mitchel Field site, labels will be utilized so that all necessary information is retained with the sample, and chain-of-custody records will be employed to maintain control over access to and destination of samples after shipment from the location of sample collection. Additionally, proper completion of field sample logs and analytical logs by appropriate field and laboratory personnel provide for thorough monitoring of the sample from collection through analysis and final report generation.

The objective of sample identification, custody, and monitoring procedures is to assure that:

All samples collected are uniquely labeled for identification purposes throughout the analytical process;

Samples are correctly analyzed and that results are traceable to field records;

Important sample characteristics are preserved;

Samples are protected from loss, damage, and tampering;

Any alteration of samples (e.g., damage due to shipment or other processes) is documented;

A record of sample integrity and analytical fate is established for legal purposes.

5.4.1 Sample Monitoring Forms

The use of the indicated forms listed above accomplishes one or more of the specific objectives of sample custody, identification, or control. The use of each of the listed forms is discussed below.

5.4.2 Sample Log

The sample log is completed in the field by the individual physically in charge of the sample collection. The sample log correlates the assigned sample bottle designation to a specific sample location or other distinguishing feature or attribute (i.e., dummy sample, replicate sample, etc.). The sample log also contains information concerning day and time of sampling, type, location, and depth, procedures utilized to preserve the sample for analysis, and the sequence in which sampling was completed. Other relevant information, such as weather conditions, may also be included. The sample log is attached to the chain-of-custody record and shipped with the samples to the laboratory. A sample log is presented in Appendix A.

5.4.3 Chain-of-Custody Record

The chain-of-custody record is completed in the field by the individual physically in charge of the sample collection. The chain-of-custody record may be completed contemporaneously with the sample log or prior to the shipment of samples to the laboratory. The chain-of-custody record contains information on the date of sample collection, the sampler, and project name and number, laboratory project number, the number of containers of each sample being shipped, and an itemization of the analyses requested for each sample together with any remarks about the sample prior to shipment. The chain-of-custody record is enclosed with the samples after it has been signed by the sampler. The record is then signed each time possession of the sample changes, with the signature of the person relinquishing and receiving the sample, as well as the time of exchange being indicated on the record. A sample copy of a chain-of-custody form is set forth in Appendix B.

6.0 MEASUREMENTS

Measurements will be made on a periodic basis to record the location of the containment wall both in horizontal and in vertical extent. The location of the wall shall be measured in relation to survey markers which are set in the field prior to the commencement of containment wall installation. These markers will be placed such that their areal location is known within 0.1 foot based upon a survey conducted from USGS benchmark. Field notes as the installation of the wall proceeds will be kept in a survey field book. All measurements will be taken to the nearest 0.1 foot. Elevations of the bottom of the containment wall will be measured to within 0.1 foot. The survey markers shall be placed every 25 feet along the length of the wall. These markers will be used to determine the horizontal location of the wall and used as temporary benchmarks for the determination of the elevation of the wall. Tapes used to measure distances shall be true and whole, without defects which would result in an error. Tapes which have been broken and then mended shall not be used. In general, all measurements should be made using a metal based tape. The inclination of the beam shall be measured using a four foot carpenter's level and a small metal ruler with at least markings every sixteenth of an inch.

7.0 CALIBRATION PROCEDURES

All equipment and analytical testing instruments shall be calibrated according to the manufacturer's instructions at least before the start of testing and halfway through completion of the quality control program. Measuring equipment, while not required to be traceable to National Bureau of Standards calibration devices, shall measure true to scale. Any instrument in error due to the use of a faulty measuring device shall be reviewed with appropriate remeasurement completed if required.

8.0 ANALYTICAL PROCEDURES

The analysis of the grout for quality control purposes involves the determination of viscosity, unit weight, and filtrate loss for each batch of grout and the determination of triaxial hydraulic conductivity, and unconfined compressive strength on every fourth batch. The procedures to be followed for assessing the triaxial hydraulic conductivity of the cured grout will be those procedures set forth in U.S. Army Corps of Engineers Manual Number EM1110-2, Appendix VII. The permeant for the testing will be recovered from a monitoring well with the slurry wall and screened in the upper sand and gravel. The unconfined compressive strength of the cured grout will be determined using the procedures set forth in ASTM D 2166.

Unit weight of the grout will be determined by mud balance test API RP-13B. Unit weight of the grout shall be not less than 1.07 grams per cubic centimeter and not more than 1.50 grams per cubic centimeter.

Marsh funnel viscosity is determined by using a marsh funnel viscometer. The funnel of the device is filled with 1,500 cubic centimeters of homogeneous grout, and the time for 946 cubic centimeters of the grout to flow through the funnel is measured and quoted as the viscosity in seconds. Viscosity shall be not less than 35 marsh funnel seconds (both before and after the Portland cement is added). Method reference for the determination of marsh funnel viscosity is API RP-13B.

Filtrate loss is measured in accordance with "Low Temperature Filtration Test" API RP-13B. Water loss shall not be greater than 60 cubic centimeters at 100 psig when tested for 30 minutes.

Appendix C

DAILY REPORT

MITCHEL FIELD REMEDIATION - PHASE 1A

VIBRATORY BEAM CEMENT-BENTONITE WALL

CLIENT:TP INDUSTRIAL

BY WOODWARD-CLYDE CONSULTANTS

Date: 1/9/86 Thurs.

BEAM DATA

Beam No.	Station Number	Time of Day Started	Total Running Time	Depth (ft)	Withdrawal Rate (ft/min)	Surface Elevation	Tip Elevation
1	9+90.00	2:10	69.23	63.6	6.80	77.6	14.0
2	9+92.29	3:59	14.11	63.6	11.50	77.6	14.0
3	9+94.79	10:58*	20.57	63.6	9.70	77.6	14.0

(Front of Beam at Station 9+86.83)

* Driven 1/10/86 - Outside wall alignment

TODAY'S PRODUCTION:

Linear feet Today = 5.29

(From Station 9+86.83 to Station 9+92.12)

Square feet Today = 336.4

Average depth Today = 63.60

TOTALS TO DATE:

Linear Feet: 5.29

Square Feet: 336.4

DAILY REPORT

MITCHEL FIELD REMEDIATION - PHASE 1A

VIBRATORY BEAM CEMENT-BENTONITE WALL

CLIENT:TP INDUSTRIAL

BY WOODWARD-CLYDE CONSULTANTS

Date: 1/13/86 Mon.

BEAM DATA

Beam No.	Station Number	Time of Day Started	Total Running Time	Depth (ft)	Withdrawal Rate (ft/min)	Surface Elevation	Tip Elevation
4	11+03.59	9:35	30.50	60.3	8.10	76.3	16.0
5	11+01.44	10:35	10.47	60.2	9.00	76.2	16.0
6	10+99.27	11:01	9.40	60.3	9.70	76.3	16.0
7	10+96.77	11:32	16.41	60.4	8.00	76.4	16.0
8	10+94.27	1:00	26.17	60.5	8.60	76.5	16.0
9	10+91.94	1:55	15.13	61.5	8.00	76.5	15.0
10	10+89.61	3:20	15.25	61.6	9.80	76.6	15.0
11	10+87.61	3:48	14.39	61.6	14.10	76.6	15.0

(Back of Beam at Station 10+84.44)

TODAY'S PRODUCTION:

Linear feet Today = 16.33

(From Station 11+00.77 to Station 10+84.44)

Square feet Today = 992.9

Average depth Today = 60.80

TOTALS TO DATE:

Linear Feet: 21.62

Square Feet: 1,329.3

DAILY REPORT

MITCHEL FIELD REMEDIATION - PHASE 1A

VIBRATORY BEAM CEMENT-BENTONITE WALL

CLIENT:TP INDUSTRIAL

BY WOODWARD-CLYDE CONSULTANTS

Date: 1/14/86 Tues.

BEAM DATA

Beam No.	Station Number	Time of Day Started	Total Running Time	Depth (ft)	Withdrawal Rate (ft/min)	Surface Elevation	Tip Elevation
12	10+87.61	10:45	10.36		- Redrive of Beam 11 -		
13	10+86.62	11:30	8.34	61.6	11.90	76.6	15.0
14	10+85.36	12:35	14.25	61.7	11.70	76.7	15.0
15	10+83.48	1:10	26.36	61.7	15.40	76.7	15.0
16	10+82.73	2:50	14.52	61.7	6.80	76.7	15.0

(Back of Beam at Station 10+79.56)

TODAY'S PRODUCTION:

Linear feet Today = 4.88

(From Station 10+84.44 to Station 10+79.56)

Square feet Today = 301.0

Average depth Today = 61.68

TOTALS TO DATE:

Linear Feet: 26.50

Square Feet: 1,630.3

DAILY REPORT

MITCHEL FIELD REMEDIATION - PHASE 1A

VIBRATORY BEAM CEMENT-BENTONITE WALL

CLIENT:TP INDUSTRIAL

BY WOODWARD-CLYDE CONSULTANTS

Date: 1/16/86 Thurs.

BEAM DATA

Beam No.	Station Number	Time of Day Started	Total Running Time	Depth (ft)	Withdrawal Rate (ft/min)	Surface Elevation	Tip Elevation
17	11+01.07	8:28	65.21	61.6	6.30	76.6	15.0

TODAY'S PRODUCTION:

Linear feet Today = .30

(From Station 11+00.77 to Station 11+01.07)

Square feet Today = 17.9

Average depth Today = 59.60

TOTALS TO DATE:

Linear Feet: 26.80

Square Feet: 1,648.2

DAILY REPORT

MITCHEL FIELD REMEDIATION - PHASE 1A

VIBRATORY BEAM CEMENT-BENTONITE WALL

CLIENT:TP INDUSTRIAL

BY WOODWARD-CLYDE CONSULTANTS

Date: 1/21/86 Tues.

BEAM DATA

Beam No.	Station Number	Time of Day Started	Total Running Time	Depth (ft)	Withdrawal Rate (ft/min)	Surface Elevation	Tip Elevation
18	11+03.35	11:38	23.00	60.3	7.83	76.3	16.0
19	11+05.63	1:19	14.00	60.3	7.46	76.3	16.0
20	11+07.91	1:45	11.00	60.3	8.23	76.3	16.0
21	11+10.28	2:21	25.28	60.3	8.34	76.3	16.0
22	11+12.29	2:58	8.31	60.2	9.47	76.2	16.0
23	11+14.31	3:15	7.06	60.2	9.58	76.2	16.0

TODAY'S PRODUCTION:

Linear feet Today = 13.24

(From Station 11+01.07 to Station 11+14.31)

Square feet Today = 797.9

Average depth Today = 60.27

TOTALS TO DATE:

Linear Feet: 40.04

Square Feet: 2,446.1

DAILY REPORT

MITCHEL FIELD REMEDIATION - PHASE 1A

VIBRATORY BEAM CEMENT-BENTONITE WALL

CLIENT:TP INDUSTRIAL

BY WOODWARD-CLYDE CONSULTANTS

Date: 1/22/86 Weds.

BEAM DATA

Beam No.	Station Number	Time of Day Started	Total Running Time	Depth (ft)	Withdrawal Rate (ft/min)	Surface Elevation	Tip Elevation
24	11+16.32	9:27	22.16	59.8	9.97	76.2	16.4
25	11+18.11	11:03	5.08	60.0	10.17	76.2	16.2
26	11+19.90	11:16	11.30	60.4	8.95	76.2	15.8
27	11+21.82	11:43	11.18	60.3	11.06	76.2	15.9
28	11+23.80	12:54	19.27	60.4	7.08	76.2	15.8
29	11+25.78	1:30	13.47	60.1	9.13	76.1	16.0
30	11+27.38	2:57	10.53	61.5	9.46	76.1	14.6
31	11+28.98	3:28	10.06	61.1	9.19	76.1	15.0

TODAY'S PRODUCTION:

Linear feet Today = 14.67

(From Station 11+14.31 to Station 11+28.98)

Square feet Today = 886.8

Average depth Today = 60.45

TOTALS TO DATE:

Linear Feet: 54.71

Square Feet: 3,332.9

DAILY REPORT

MITCHEL FIELD REMEDIATION - PHASE 1A

VIBRATORY BEAM CEMENT-BENTONITE WALL

CLIENT:TP INDUSTRIAL

BY WOODWARD-CLYDE CONSULTANTS

Date: 1/23/86 Thurs.

BEAM DATA

Beam No.	Station Number	Time of Day Started	Total Running Time	Depth (ft)	Withdrawal Rate (ft/min)	Surface Elevation	Tip Elevation
32	11+30.48	8:46	26.03	60.0	11.04	76.1	16.1
33	11+31.86	9:41	18.03	59.7	9.58	76.1	16.4
34	11+33.69	10:26	32.71	59.7	8.67	76.1	16.4

TODAY'S PRODUCTION:

Linear feet Today = 4.71

(From Station 11+28.98 to Station 11+33.69)

Square feet Today = 281.6

Average depth Today = 59.80

TOTALS TO DATE:

Linear Feet: 59.42

Square Feet: 3,614.6

DAILY REPORT

MITCHEL FIELD REMEDIATION - PHASE 1A

VIBRATORY BEAM CEMENT-BENTONITE WALL

CLIENT:TP INDUSTRIAL

BY WOODWARD-CLYDE CONSULTANTS

Date: 1/31/86 Fri.

BEAM DATA

Beam No.	Station Number	Time of Day Started	Total Running Time	Depth (ft)	Withdrawal Rate (ft/min)	Surface Elevation	Tip Elevation
35	11+37.91	10:22	23.35	60.4	8.43	76.1	15.7
36	11+35.80	10:56	7.12	60.4	8.84	76.1	15.7
37	11+40.19	11:15	13.50	59.7	8.14	76.1	16.4
38	11+41.80	11:45	5.50	60.1	9.74	76.1	16.0
39	11+43.21	1:45	6.59	60.1	10.42	76.1	16.0
40	11+45.00	2:32	11.36	60.0	9.47	76.2	16.2
41	11+46.78	2:55	15.08	60.0	10.23	76.2	16.2
42	11+48.57	3:15	9.04	60.0	11.11	76.2	16.2
43	11+51.03	3:38	14.34	59.7	10.44	76.2	16.5

TODAY'S PRODUCTION:

Linear feet Today = 17.34

(From Station 11+33.69 to Station 11+51.03)

Square feet Today = 1041.2

Average depth Today = 60.04

TOTALS TO DATE:

Linear Feet: 76.76

Square Feet: 4,655.7

DAILY REPORT

MITCHEL FIELD REMEDIATION - PHASE 1A

VIBRATORY BEAM CEMENT-BENTONITE WALL

CLIENT: TP INDUSTRIAL

BY WOODWARD-CLYDE CONSULTANTS

Date: 2/3/86 Mon.

BEAM DATA

Beam No.	Station Number	Time of Day Started	Total Running Time	Depth (ft)	Withdrawal Rate (ft/min)	Surface Elevation	Tip Elevation
44	11+52.97	8:45	17.03	60.4	10.19	76.2	15.8
45	11+54.37	10:35	18.55	60.1	10.04	76.2	16.1
46	11+56.54	11:20	10.05	60.2	8.30	76.2	16.0
47	11+58.70	11:45	11.50	60.1	10.96	76.2	16.1
48	11+60.74	12:45	10.20	60.1	11.38	76.2	16.1
49	11+62.78	1:10	10.34	60.2	10.00	76.3	16.1
50	11+64.58	1:40	12.06	59.9	10.76	76.3	16.4
51	11+66.37	2:05	15.04	59.8	9.75	76.3	16.5

TODAY'S PRODUCTION:

Linear feet Today = 15.34

(From Station 11+51.03 to Station 11+66.37)

Square feet Today = 921.9

Average depth Today = 60.10

TOTALS TO DATE:

Linear Feet: 92.10

Square Feet: 5,577.6

DAILY REPORT

MITCHEL FIELD REMEDIATION - PHASE 1A

VIBRATORY BEAM CEMENT-BENTONITE WALL

CLIENT:TP INDUSTRIAL

BY WOODWARD-CLYDE CONSULTANTS

Date: 2/6/86 Thurs.

BEAM DATA

Beam No.	Station Number	Time of Day Started	Total Running Time	Depth (ft)	Withdrawal Rate (ft/min)	Surface Elevation	Tip Elevation
52	11+68.48	10:04	13.56	60.3	9.32	76.3	16.0
53	11+70.47	10:44	10.43	60.3	9.65	76.3	16.0
54	11+72.45	11:05	14.12	60.2	10.81	76.3	16.1
55	11+74.30	11:37	11.50	60.2	10.59	76.3	16.1
56	11+76.14	12:40	8.51	60.1	10.76	76.3	16.2
57	11+77.99	12:58	10.33	60.0	9.76	76.3	16.3
58	11+79.87	1:47	20.58	60.0	10.71	76.3	16.3
59	11+81.78	2:48	10.25	60.1	11.06	76.3	16.2

TODAY'S PRODUCTION:

Linear feet Today = 15.41

(From Station 11+66.37 to Station 11+81.78)

Square feet Today = 926.9

Average depth Today = 60.15

TOTALS TO DATE:

Linear Feet: 107.51

Square Feet: 6,504.6

DAILY REPORT

MITCHEL FIELD REMEDIATION - PHASE 1A

VIBRATORY BEAM CEMENT-BENTONITE WALL

CLIENT:TP INDUSTRIAL

BY WOODWARD-CLYDE CONSULTANTS

Date: 2/10/86 Mon.

BEAM DATA

Beam No.	Station Number	Time of Day Started	Total Running Time	Depth (ft)	Withdrawal Rate (ft/min)	Surface Elevation	Tip Elevation
60	12+22.25	9:37	21.04	61.9	9.75	76.8	14.9
61	12+20.14	10:08	8.03	61.9	9.19	76.8	14.9
62	12+17.85	10:24	8.36	61.8	9.71	76.8	15.0
63	12+15.56	10:41	11.01	61.7	7.37	76.8	15.1
64	12+13.27	11:07	9.37	61.7	8.23	76.8	15.1
65	12+10.93	11:27	9.35	61.7	10.73	76.7	15.0
66	12+08.60	11:45	10.26	61.6	8.40	76.7	15.1
67	12+07.02	12:50	8.47	61.6	11.03	76.7	15.1
68	12+04.93	1:07	16.59	61.8	9.13	76.7	14.9
69	12+02.89	1:40	9.32	61.6	11.07	76.7	15.1
70	12+00.85	2:00	8.45	61.5	9.87	76.7	15.2
71	11+98.72	2:35	11.17	61.5	9.00	76.7	15.2
72	11+96.60	3:06	15.36	61.6	11.07	76.7	15.1
73	11+94.52	3:30	15.27	61.5	9.37	76.7	15.2

(Back of beam at Station 11+91.91)

TODAY'S PRODUCTION:

Linear feet Today = 29.34

(From Station 12+21.25 to Station 11+91.91)

Square feet Today = 1809.4

Average depth Today = 61.67

TOTALS TO DATE:

Linear Feet: 136.85

Square Feet: 8,314.0

DAILY REPORT

MITCHEL FIELD REMEDIATION - PHASE 1A

VIBRATORY BEAM CEMENT-BENTONITE WALL

CLIENT:TP INDUSTRIAL

BY WOODWARD-CLYDE CONSULTANTS

Date: 2/12/86 Weds.

BEAM DATA

Beam No.	Station Number	Time of Day Started	Total Running Time	Depth (ft)	Withdrawal Rate (ft/min)	Surface Elevation	Tip Elevation
74	11+92.52	9:10	17.14	60.4	10.66	76.6	16.2
75	11+90.68	10:35	22.11	60.1	9.20	76.5	16.4
76	11+88.43	11:40	29.39	60.1	7.96	76.5	16.4
77	11+86.18	1:06	41.05	60.0	7.19	76.5	16.5
78	11+84.18	2:30	34.50	59.7	12.93	76.5	16.8
79	11+81.48	5:39	11.03	59.6	11.32	76.4	16.8

TODAY'S PRODUCTION:

Linear feet Today = 10.13

(From Station 11+91.91 to Station 11+81.78)

Square feet Today = 607.6

Average depth Today = 59.98

TOTALS TO DATE:

Linear Feet: 146.98

Square Feet: 8,921.6

DAILY REPORT

MITCHEL FIELD REMEDIATION - PHASE 1A

VIBRATORY BEAM CEMENT-BENTONITE WALL

CLIENT:TP INDUSTRIAL

BY WOODWARD-CLYDE CONSULTANTS

Date: 2/24/86 Mon.

BEAM DATA

Beam No.	Station Number	Time of Day Started	Total Running Time	Depth (ft)	Withdrawal Rate (ft/min)	Surface Elevation	Tip Elevation
80	10+82.73	11:04	5.45	60.1	7.39	76.7	16.6
81	10+81.25	—	14.15	60.5	9.45	76.8	16.3
82	10+79.35	—	10.48	60.2	9.05	76.8	16.6
83	10+77.44	—	10.50	60.2	9.29	76.8	16.6

(Back of beam at Station 10+74.86)

TODAY'S PRODUCTION:

Linear feet Today = 4.70

(From Station 10+79.56 to Station 10+74.86)

Square feet Today = 283.2

Average depth Today = 60.25

TOTALS TO DATE:

Linear Feet: 151.68

Square Feet: 9204.8

DAILY REPORT

MITCHEL FIELD REMEDIATION - PHASE 1A

VIBRATORY BEAM CEMENT-BENTONITE WALL

CLIENT:TP INDUSTRIAL

BY WOODWARD-CLYDE CONSULTANTS

Date: 2/27/86 Thurs.

BEAM DATA

Beam No.	Station Number	Time of Day Started	Total Running Time	Depth (ft)	Withdrawal Rate (ft/min)	Surface Elevation	Tip Elevation
84	9+93.70	10:02	15.20	62.0	7.15	77.6	15.6
85	9+95.61	10:35	6.06	61.8	8.20	77.6	15.8
86	9+97.65	10:55	6.17	61.6	8.25	77.6	16.0
87	9+99.68	11:15	6.29	61.6	7.54	77.5	15.9
88	10+01.81	11:30	10.12	61.6	9.80	77.5	15.9
89	10+03.93	11:46	10.57	61.5	8.56	77.4	15.9
90	10+06.10	1:20	9.58	61.4	8.71	77.4	16.0
91	10+08.26	1:40	7.37	61.3	9.83	77.3	16.0
92	10+10.51	1:55	12.20	61.2	6.55	77.3	16.1
93	10+12.76	2:42	8.50	61.2	7.90	77.2	16.0
94	10+15.18	3:05	10.04	61.2	8.40	77.2	16.0
95	10+17.59	3:25	8.05	61.1	10.02	77.1	16.0
96	10+19.76	3:42	10.18	61.1	11.42	77.1	16.0
97	10+21.93	4:00	11.13	61.0	14.08	77.0	16.0
98	10+24.26	4:18	12.23	60.6	9.44	77.0	16.4
99	10+26.59	4:38	13.08	60.6	7.38	76.9	16.3

TODAY'S PRODUCTION:

Linear feet Today = 34.47

(From Station 9+92.12 to Station 10+26.59)

Square feet Today = 2113.0

Average depth Today = 61.30

TOTALS TO DATE:

Linear Feet: 186.15

Square Feet: 11,317.8

DAILY REPORT

MITCHEL FIELD REMEDIATION - PHASE 1A

VIBRATORY BEAM CEMENT-BENTONITE WALL

CLIENT:TP INDUSTRIAL

BY WOODWARD-CLYDE CONSULTANTS

Date: 2/28/86 Fri.

BEAM DATA

Beam No.	Station Number	Time of Day Started	Total Running Time	Depth (ft)	Withdrawal Rate (ft/min)	Surface Elevation	Tip Elevation
100	10+28.84	10:56	8.00	60.9	8.21	76.9	16.0
101	10+30.93	11:13	7.59	60.9	9.11	76.9	16.0
102	10+33.01	11:35	7.25	60.8	8.79	76.8	16.0
103	10+34.93	11:51	10.38	60.8	9.87	76.8	16.0
104	10+36.84	1:35	10.17	60.9	11.21	76.7	15.8
105	10+38.88	1:53	13.25	60.7	11.49	76.7	16.0
106	NC0+01.58	4:35	3.57	62.3	9.23	78.2	15.9
107	NC0+03.89	4:58	7.32	62.3	8.23	78.2	15.9
108	NC0+06.19	5:13	11.42	62.2	8.33	78.2	16.0
109	NC0+08.50	5:35	10.58	62.1	10.99	78.2	16.1

TODAY'S PRODUCTION:

Linear feet Today = 20.79

(From Station 10+26.59 to Station NC0+08.50)

Square feet Today = 1276.5

Average depth Today = 61.40*

*Computed using a weighted average

TOTALS TO DATE:

Linear Feet: 206.94

Square Feet: 12,594.3

DAILY REPORT

MITCHEL FIELD REMEDIATION - PHASE 1A

VIBRATORY BEAM CEMENT-BENTONITE WALL

CLIENT:TP INDUSTRIAL

BY WOODWARD-CLYDE CONSULTANTS

Date: 3/1/86 Sat.

BEAM DATA

Beam No.	Station Number	Time of Day Started	Total Running Time	Depth (ft)	Withdrawal Rate (ft/min)	Surface Elevation	Tip Elevation
110	NC0+11.08	9:17	6.42	62.2	11.55	78.2	16.0
111	NC0+13.36	9:52	8.27	62.2	10.88	78.2	16.0
112	NC0+15.63	10:07	8.15	62.2	10.20	78.2	16.0
113	NC0+17.63	10:27	11.39	62.0	10.05	78.2	16.2

TODAY'S PRODUCTION:

Linear feet Today = 9.13

(From Station NC0+08.50 to Station NC0+17.63)

Square feet Today = 567.4

Average depth Today = 62.15

TOTALS TO DATE:

Linear Feet: 216.07

Square Feet: 13,161.3

DAILY REPORT

MITCHEL FIELD REMEDIATION - PHASE 1A

VIBRATORY BEAM CEMENT-BENTONITE WALL

CLIENT:TP INDUSTRIAL

BY WOODWARD-CLYDE CONSULTANTS

Date: 3/4/86 Tues.

BEAM DATA

Beam No.	Station Number	Time of Day Started	Total Running Time	Depth (ft)	Withdrawal Rate (ft/min)	Surface Elevation	Tip Elevation
114	NC0+19.63	11:42	6.59	62.1	9.75	78.2	16.1
115	NC0+21.51	12:30	5.38	62.0	9.59	78.1	16.1
116	NC0+23.38	12:55	7.56	61.9	8.44	78.0	16.1
117	NC0+25.01	1:14	7.24	61.8	10.02	77.9	16.1
118	NC0+26.63	1:30	8.20	61.7	8.86	77.8	16.1
119	NC0+28.42	2:22	13.13	61.6	7.33	77.7	16.1
120	NC0+30.21	2:50	7.57	61.5	8.64	77.6	16.1

(Actual distance between NC0+00 and 9+86.83 is 28.57 feet)

TODAY'S PRODUCTION:

Linear feet Today = 10.94

(From Station NC0+17.63 to Station NC0+28.57=9+86.83)

Square feet Today = 676.1

Average depth Today = 61.80

TOTALS TO DATE:

Linear Feet: 227.01

Square Feet: 13,837.8

DAILY REPORT

MITCHEL FIELD REMEDIATION - PHASE 1A

VIBRATORY BEAM CEMENT-BENTONITE WALL

CLIENT:TP INDUSTRIAL

BY WOODWARD-CLYDE CONSULTANTS

Date: 3/5/86 Weds.

BEAM DATA

Beam No.	Station Number	Time of Day Started	Total Running Time	Depth (ft)	Withdrawal Rate (ft/min)	Surface Elevation	Tip Elevation
121	9+56.77	1:36	10.10	62.4	8.43	78.2	15.8
122	9+54.98	1:55	4.54	62.2	9.74	78.2	16.0
123	9+53.19	2:24	7.43	62.2	10.76	78.2	16.0
124	9+51.40	2:39	6.41	62.3	9.73	78.2	15.9
125	9+49.27	2:55	8.22	62.3	9.30	78.2	15.9
126	9+47.15	3:12	8.06	62.2	8.66	78.2	16.0
127	9+44.98	3:29	9.29	62.2	9.35	78.2	16.0

(Back of beam at Station 9+42.40)

TODAY'S PRODUCTION:

Linear feet Today = 13.37

(From Station 9+55.77 to Station 9+42.40)

Square feet Today = 832.4

Average depth Today = 62.26

TOTALS TO DATE:

Linear Feet: 240.38

Square Feet: 14,670.2

DAILY REPORT

MITCHEL FIELD REMEDIATION - PHASE 1A

VIBRATORY BEAM CEMENT-BENTONITE WALL

CLIENT:TP INDUSTRIAL

BY WOODWARD-CLYDE CONSULTANTS

Date: 3/6/86 Thurs.

BEAM DATA

Beam No.	Station Number	Time of Day Started	Total Running Time	Depth (ft)	Withdrawal Rate (ft/min)	Surface Elevation	Tip Elevation
128	9+42.98	12:42	6.50	62.2	8.01	78.2	16.0
129	9+40.98	12:58	6.04	62.2	10.57	78.2	16.0
130	9+38.98	1:11	8.29	62.2	9.17	78.2	16.0
131	9+37.23	1:29	8.32	62.2	9.10	78.2	16.0

(Back of beam at Station 9+34.65)

TODAY'S PRODUCTION:

Linear feet Today = 7.75

(From Station 9+42.40 to Station 9+34.65)

Square feet Today = 482.0

Average depth Today = 62.20

TOTALS TO DATE:

Linear Feet: 248.13

Square Feet: 15,152.3

DAILY REPORT

MITCHEL FIELD REMEDIATION - PHASE 1A

VIBRATORY BEAM CEMENT-BENTONITE WALL

CLIENT:TP INDUSTRIAL

BY WOODWARD-CLYDE CONSULTANTS

Date: 3/7/86 Fri.

BEAM DATA

Beam No.	Station Number	Time of Day Started	Total Running Time	Depth (ft)	Withdrawal Rate (ft/min)	Surface Elevation	Tip Elevation
132	9+35.23	1:03	7.23	62.7	9.38	78.2	15.5
133	9+33.23	1:21	7.25	62.4	10.31	78.2	15.8
134	9+31.23	1:34	7.51	62.3	8.75	78.2	15.9
135	9+29.20	1:51	8.25	62.2	9.64	78.2	16.0
136	9+27.17	2:31	7.44	62.2	9.12	78.2	16.0
137	9+25.15	2:49	13.45	62.2	8.82	78.2	16.0
138	9+23.36	3:15	10.30	62.2	10.51	78.2	16.0
139	9+21.57	3:35	10.33	62.2	9.40	78.2	16.0

(Back of beam at Station 9+18.99)

TODAY'S PRODUCTION:

Linear feet Today = 15.66

(From Station 9+34.65 to Station 9+18.99)

Square feet Today = 975.6

Average depth Today = 62.30

TOTALS TO DATE:

Linear Feet: 263.79

Square Feet: 16,127.9

DAILY REPORT

MITCHEL FIELD REMEDIATION - PHASE 1A

VIBRATORY BEAM CEMENT-BENTONITE WALL

CLIENT:TP INDUSTRIAL

BY WOODWARD-CLYDE CONSULTANTS

Date: 3/10/86 Mon.

BEAM DATA

Beam No.	Station Number	Time of Day Started	Total Running Time	Depth (ft)	Withdrawal Rate (ft/min)	Surface Elevation	Tip Elevation
140	9+19.57	8:35	7.46	62.2	9.59	78.1	15.9
141	9+17.61	8:54	6.18	62.2	9.10	78.1	15.9
142	9+15.65	9:34	6.44	62.2	10.11	78.1	15.9
143	9+13.82	9:45	10.04	62.1	10.21	78.1	16.0
144	9+11.98	10:04	7.04	62.1	9.34	78.1	16.0
145	9+10.15	10:20	13.43	62.1	10.38	78.1	16.0
146	9+08.23	10:42	12.00	62.1	9.32	78.1	16.0
147	9+05.90	11:24	10.09	62.1	9.65	78.1	16.0
148	9+03.90	11:41	10.56	62.1	9.60	78.1	16.0

(Back of beam at Station 9+01.32)

TODAY'S PRODUCTION:

Linear feet Today = 17.67

(From Station 9+18.99 to Station 9+01.32)

Square feet Today = 1097.9

Average depth Today = 62.13

TOTALS TO DATE:

Linear Feet: 281.46

Square Feet: 17,225.8

DAILY REPORT

MITCHEL FIELD REMEDIATION - PHASE 1A

VIBRATORY BEAM CEMENT-BENTONITE WALL

CLIENT:TP INDUSTRIAL

BY WOODWARD-CLYDE CONSULTANTS

Date: 3/11/86 Tues.

BEAM DATA

Beam No.	Station Number	Time of Day Started	Total Running Time	Depth (ft)	Withdrawal Rate (ft/min)	Surface Elevation	Tip Elevation
149	9+01.90	1:30	18.00	62.0	8.29	78.1	16.1
150	9+01.15	--	--	62.1	--	78.1	16.0
151	8+98.65	--	--	62.1	--	78.1	16.0

(Back of beam at Station 8+96.07)

-- Not reported

TODAY'S PRODUCTION:

Linear feet Today = 5.25

(From Station 9+01.32 to Station 8+96.07)

Square feet Today = 325.8

Average depth Today = 62.07

TOTALS TO DATE:

Linear Feet: 286.71

Square Feet: 17,551.6

DAILY REPORT

MITCHEL FIELD REMEDIATION - PHASE 1A

VIBRATORY BEAM CEMENT-BENTONITE WALL

CLIENT:TP INDUSTRIAL

BY WOODWARD-CLYDE CONSULTANTS

Date: 3/12/86 Weds.

BEAM DATA

Beam No.	Station Number	Time of Day Started	Total Running Time	Depth (ft)	Withdrawal Rate (ft/min)	Surface Elevation	Tip Elevation
152	8+96.65	8:07	6.07	61.9	7.58	78.1	16.2
153	8+94.82	8:31	11.50	61.9	8.84	78.1	16.2
154	8+92.99	8:59	10.43	62.0	10.08	78.1	16.1
155	8+90.93	10:47	12.34	62.0	8.63	78.2	16.2
156	8+88.87	11:07	10.49	61.8	9.20	78.2	16.4
157	8+86.81	11:26	12.06	61.8	10.69	78.2	16.4
158	8+84.75	11:45	12.13	61.5	8.42	78.2	16.7
159	8+82.69	12:57	15.28	61.6	8.78	78.2	16.6
160	8+80.58	1:21	15.36	61.6	8.88	78.2	16.6
161	8+78.47	1:42	17.08	61.7	9.47	78.3	16.6
162	8+76.36	2:27	12.34	61.7	10.11	78.3	16.6
163	8+75.36	3:51	3.55	61.7	9.28	78.3	16.6
164	8+73.44	4:01	10.45	61.7	9.82	78.3	16.6
165	8+71.53	4:21	14.19	61.7	8.75	78.3	16.6
166	8+69.61	4:42	17.22	61.7	10.06	78.3	16.6

(Back of beam at Station 8+67.03)

TODAY'S PRODUCTION:

Linear feet Today = 29.04

(From Station 8+96.07 to Station 8+67.03)

Square feet Today = 1793.3

Average depth Today = 61.75

TOTALS TO DATE:

Linear Feet: 315.75

Square Feet: 19,345.0

DAILY REPORT

MITCHEL FIELD REMEDIATION - PHASE 1A

VIBRATORY BEAM CEMENT-BENTONITE WALL

CLIENT:TP INDUSTRIAL

BY WOODWARD-CLYDE CONSULTANTS

Date: 3/13/86 Thurs.

BEAM DATA

Beam No.	Station Number	Time of Day Started	Total Running Time	Depth (ft)	Withdrawal Rate (ft/min)	Surface Elevation	Tip Elevation
167	8+72.11	8:55	6.45	62.0	11.45	78.3	16.3
168	8+69.88	9:09	3.49	61.9	12.42	78.3	16.4
169	8+67.97	9:42	7.43	62.0	13.14	78.3	16.3
170	8+65.96	9:57	20.51	62.0	12.12	78.3	16.3
171	8+63.93	11:23	13.02	62.0	11.81	78.3	16.3
172	8+61.95	11:45	9.04	62.0	9.95	78.3	16.3
173	8+59.98	12:52	14.07	62.1	8.73	78.4	16.3
174	8+57.98	2:44	6.15	62.2	10.28	78.4	16.2
175	8+55.91	3:00	6.45	62.3	10.13	78.4	16.1
176	8+53.84	3:13	10.08	62.2	9.95	78.4	16.2
177	8+51.77	3:29	13.43	62.3	8.36	78.4	16.1
178	8+49.70	3:53	11.45	62.0	9.71	78.4	16.4
179	8+47.63	4:12	11.35	62.2	7.57	78.4	16.2

(Back of beam at Station 8+45.05)

TODAY'S PRODUCTION:

Linear feet Today = 21.98

(From Station 8+67.03 to Station 8+45.05)

Square feet Today = 1364.8

Average depth Today = 62.09

TOTALS TO DATE:

Linear Feet: 337.73

Square Feet: 20,709.8

DAILY REPORT

MITCHEL FIELD REMEDIATION - PHASE 1A

VIBRATORY BEAM CEMENT-BENTONITE WALL

CLIENT:TP INDUSTRIAL

BY WOODWARD-CLYDE CONSULTANTS

Date: 3/17/86 Mon.

BEAM DATA

Beam No.	Station Number	Time of Day Started	Total Running Time	Depth (ft)	Withdrawal Rate (ft/min)	Surface Elevation	Tip Elevation
180	8+45.63	9:43	9.50	62.4	10.49	78.4	16.0
181	8+43.60	—	—	62.4	—	78.5	16.1
182	8+41.48	—	6.02	62.5	9.87	78.5	16.0
183	8+39.40	1:07	—	62.8	—	78.6	15.8
184	8+37.50	—	6.05	63.0	10.44	78.6	15.6
185	8+35.60	—	7.56	63.1	10.40	78.7	15.6
186	8+33.70	—	—	63.1	—	78.7	15.6

(Back of Beam at Station 8+31.12)

— Not Reported

TODAY'S PRODUCTION:

Linear feet Today = 13.93

(From Station 8+45.05 to Station 8+31.12)

Square feet Today = 874.2

Average depth Today = 62.76

TOTALS TO DATE:

Linear Feet: 351.66

Square Feet: 21,584.0

DAILY REPORT

MITCHEL FIELD REMEDIATION - PHASE 1A

VIBRATORY BEAM CEMENT-BENTONITE WALL

CLIENT:TP INDUSTRIAL

BY WOODWARD-CLYDE CONSULTANTS

Date: 3/18/86 Tues.

BEAM DATA

Beam No.	Station Number	Time of Day Started	Total Running Time	Depth (ft)	Withdrawal Rate (ft/min)	Surface Elevation	Tip Elevation
187	7+67.60	9:15	8.51	63.2	8.99	78.8	15.6
188	7+69.81	1:02	4.05	63.2	9.36	78.8	15.6
189	7+72.01	1:13	6.18	63.2	9.53	78.8	15.6
190	7+74.22	1:29	6.39	63.2	9.46	78.8	15.6
191	7+76.42	1:44	9.49	63.2	9.27	78.8	15.6
192	7+78.52	3:27	6.18	63.2	6.07	78.8	15.6
193	7+80.67	3:47	5.57	63.2	9.36	78.8	15.6
194	7+82.82	4:00	5.55	63.2	9.07	78.8	15.6
195	7+84.97	4:15	9.30	63.2	10.36	78.8	15.6
196	7+87.17	4:45	5.22	63.2	10.14	78.8	15.6

(Front of Beam at Station 7+65.02)

TODAY'S PRODUCTION:

Linear feet Today = 22.15

(From Station 7+65.02 to Station 7+87.17)

Square feet Today = 1399.9

Average depth Today = 63.20

TOTALS TO DATE:

Linear Feet: 373.81

Square Feet: 22,983.8

DAILY REPORT

MITCHEL FIELD REMEDIATION - PHASE 1A

VIBRATORY BEAM CEMENT-BENTONITE WALL

CLIENT:TP INDUSTRIAL

BY WOODWARD-CLYDE CONSULTANTS

Date: 3/19/86 Weds.

BEAM DATA

Beam No.	Station Number	Time of Day Started	Total Running Time	Depth (ft)	Withdrawal Rate (ft/min)	Surface Elevation	Tip Elevation
197	7+89.17	8:28	6.28	63.3	10.55	78.8	15.5
198	7+91.42	8:45	9.03	63.3	9.50	78.8	15.5
199	7+93.67	9:02	8.23	63.3	9.71	78.8	15.5
200	7+95.93	9:44	8.45	63.3	10.16	78.8	15.5
201	7+98.18	10:00	13.15	63.2	10.19	78.8	15.6
202	8+00.43	10:22	11.06	63.3	10.07	78.8	15.5
203	8+02.68	12:37	10.18	63.3	9.86	78.8	15.5
204	8+04.68	2:05	6.48	63.3	8.26	78.8	15.5
205	8+06.98	2:32	8.11	63.1	9.01	78.8	15.7
206	8+09.28	3:29	1.55	63.3	9.54	78.8	15.5
207	8+11.58	4:50	7.37	63.3	9.00	78.8	15.5

TODAY'S PRODUCTION:

Linear feet Today = 24.41

(From Station 7+87.17 to Station 8+11.58)

Square feet Today = 1544.5

Average depth Today = 63.27

TOTALS TO DATE:

Linear Feet: 398.22

Square Feet: 24,528.3

DAILY REPORT

MITCHEL FIELD REMEDIATION - PHASE 1A

VIBRATORY BEAM CEMENT-BENTONITE WALL

CLIENT:TP INDUSTRIAL

BY WOODWARD-CLYDE CONSULTANTS

Date: 3/20/86 Thurs.

BEAM DATA

Beam No.	Station Number	Time of Day Started	Total Running Time	Depth (ft)	Withdrawal Rate (ft/min)	Surface Elevation	Tip Elevation
208	8+13.58	8:01	8.55	63.3	10.61	78.7	15.4
209	8+15.78	8:20	7.33	63.3	8.96	78.7	15.4
210	8+17.99	8:38	9.32	63.1	10.18	78.7	15.6
211	8+20.19	10:58	14.25	63.0	10.30	78.7	15.7
212	8+22.40	11:21	16.50	62.8	9.99	78.7	15.9
213	8+24.60	11:45	17.11	62.7	9.43	78.7	16.0
214	8+26.80	1:14	6.43	62.7	9.77	78.7	16.0
215	8+28.65	1:27	10.45	62.6	10.18	78.6	16.0
216	8+30.50	1:46	8.42	62.6	8.73	78.6	16.0
217	8+32.30	2:47	23.37	62.6	9.61	78.6	16.0

TODAY'S PRODUCTION:

Linear feet Today = 19.54

(From Station 8+11.58 to Station 8+31.12)

Square feet Today = 1228.4

Average depth Today = 62.87

TOTALS TO DATE:

Linear Feet: 417.76

Square Feet: 25,756.7

DAILY REPORT

MITCHEL FIELD REMEDIATION - PHASE 1A

VIBRATORY BEAM CEMENT-BENTONITE WALL

CLIENT:TP INDUSTRIAL

BY WOODWARD-CLYDE CONSULTANTS

Date: 3/21/86 Fri.

BEAM DATA

Beam No.	Station Number	Time of Day Started	Total Running Time	Depth (ft)	Withdrawal Rate (ft/min)	Surface Elevation	Tip Elevation
218	7+66.00	2:35	7.35	65.8	10.67	81.9	16.1
219	7+64.18	2:57	7.00	65.9	10.38	81.9	16.0
220	7+62.37	3:12	15.28	66.0	11.06	82.0	16.0
221	7+60.55	3:36	5.02	66.0	10.91	82.0	16.0
222	7+58.58	3:49	7.10	66.0	10.50	82.0	16.0
223	7+56.60	4:04	9.43	65.9	10.30	82.0	16.1
224	7+54.63	4:22	14.16	66.0	10.50	82.1	16.1
225	7+53.21	4:44	8.54	66.0	10.85	82.1	16.1

(Back of Beam at Station 7+50.63)

TODAY'S PRODUCTION:

Linear feet Today = 14.39

(From Station 7+65.02 to Station 7+50.63)

Square feet Today = 949.0

Average depth Today = 65.95

TOTALS TO DATE:

Linear Feet: 432.15

Square Feet: 26,705.8

DAILY REPORT

MITCHEL FIELD REMEDIATION - PHASE 1A

VIBRATORY BEAM CEMENT-BENTONITE WALL

CLIENT:TP INDUSTRIAL

BY WOODWARD-CLYDE CONSULTANTS

Date: 3/24/86 Mon.

BEAM DATA

Beam No.	Station Number	Time of Day Started	Total Running Time	Depth (ft)	Withdrawal Rate (ft/min)	Surface Elevation	Tip Elevation
226	7+55.55	10:12	15.40	66.0	10.62	82.1	16.1
227	7+49.97	10:26	13.43	66.0	10.94	82.1	16.1
228	7+47.80	12:56	15.00	66.0	11.12	82.1	16.1
229	7+45.74	1:20	9.03	66.1	10.52	82.2	16.1
230	7+43.68	1:35	18.30	66.2	11.19	82.2	16.0
231	7+41.63	2:01	21.19	66.0	10.39	82.2	16.2
232	7+39.40	2:31	22.00	65.9	10.83	82.2	16.3
233	7+37.17	3:33	23.01	65.9	9.91	82.3	16.4
234	7+34.93	4:10	23.26	65.8	9.54	82.3	16.5
235	7+33.18	4:40	23.26	65.8	11.28	82.3	16.5

(Back of Beam at Station 7+30.60 - Corner at Station 7+32.77 = 2.17 foot Overlap)

TODAY'S PRODUCTION:

Linear feet Today = 17.86

(From Station 7+50.63 to Station 7+32.77)

Square feet Today = 1178.2

Average depth Today = 65.97

TOTALS TO DATE:

Linear Feet: 450.01

Square Feet: 27,884.0

DAILY REPORT

MITCHEL FIELD REMEDIATION - PHASE 1A

VIBRATORY BEAM CEMENT-BENTONITE WALL

CLIENT:TP INDUSTRIAL

BY WOODWARD-CLYDE CONSULTANTS

Date: 3/25/86 Tues.

BEAM DATA

Beam No.	Station Number	Time of Day Started	Total Running Time	Depth (ft)	Withdrawal Rate (ft/min)	Surface Elevation	Tip Elevation
236	7+33.77	10:15	11.57	67.0	11.26	82.8	15.8
237	7+30.61	10:37	18.27	66.9	7.72	82.8	15.9
238	7+28.25	11:39	23.07	66.8	9.97	82.8	16.0
239	7+25.89	12:55	30.27	66.6	9.99	82.8	16.2
240	7+24.47	2:39	10.25	66.5	11.15	82.8	16.3
241	7+22.25	3:22	17.32	66.5	10.93	82.8	16.3
242	7+20.02	3:47	16.28	66.5	10.39	82.8	16.3

(Back of Beam at Station 7+17.44)

TODAY'S PRODUCTION:

Linear feet Today = 15.33

(From Station 7+32.77 to Station 7+17.44)

Square feet Today = 1022.3

Average depth Today = 66.68

TOTALS TO DATE:

Linear Feet: 465.34

Square Feet: 28,906.3

DAILY REPORT

MITCHEL FIELD REMEDIATION - PHASE 1A

VIBRATORY BEAM CEMENT-BENTONITE WALL

CLIENT:TP INDUSTRIAL

BY WOODWARD-CLYDE CONSULTANTS

Date: 3/26/86 Weds.

BEAM DATA

Beam No.	Station Number	Time of Day Started	Total Running Time	Depth (ft)	Withdrawal Rate (ft/min)	Surface Elevation	Tip Elevation
243	7+17.80	1:07	55.20	66.6	10.52	82.8	16.2
244	7+15.80	3:08	8.06	66.5	9.52	82.8	16.3
245	7+13.80	3:24	9.54	66.3	9.38	82.8	16.5
246	7+11.80	3:43	15.45	66.3	9.14	82.8	16.5
247	7+09.80	4:07	18.22	66.3	8.80	82.8	16.5
248	7+07.80	4:46	9.33	66.3	9.82	82.8	16.5

(Back of Beam at Station 7+05.22)

TODAY'S PRODUCTION:

Linear feet Today = 12.22

(From Station 7+17.44 to Station 7+05.22)

Square feet Today = 811.2

Average depth Today = 66.38

TOTALS TO DATE:

Linear Feet: 477.56

Square Feet: 29,717.5

DAILY REPORT

MITCHEL FIELD REMEDIATION - PHASE 1A

VIBRATORY BEAM CEMENT-BENTONITE WALL

CLIENT:TP INDUSTRIAL

BY WOODWARD-CLYDE CONSULTANTS

Date: 3/27/86 Thurs.

BEAM DATA

Beam No.	Station Number	Time of Day Started	Total Running Time	Depth (ft)	Withdrawal Rate (ft/min)	Surface Elevation	Tip Elevation
249	7+05.80	7:38	12.25	66.4	11.07	82.8	16.4
250	7+03.63	8:18	13.53	66.3	7.41	82.8	16.5
251	7+01.47	1:01	21.00	65.8	9.87	82.8	17.0
252	6+99.25	—	--	65.8	--	82.8	17.0
253	6+97.02	1:55	22.04	65.5	9.95	82.8	17.3
254	6+94.80	2:55	21.15	65.3	9.87	82.8	17.5

(Back of Beam at Station 6+92.22)

-- Not Reported

TODAY'S PRODUCTION:

Linear feet Today = 13.00

(From Station 7+05.22 to Station 6+92.22)

Square feet Today = 856.0

Average depth Today = 65.85

TOTALS TO DATE:

Linear Feet: 490.56

Square Feet: 30,573.5

DAILY REPORT

MITCHEL FIELD REMEDIATION - PHASE 1A

VIBRATORY BEAM CEMENT-BENTONITE WALL

CLIENT:TP INDUSTRIAL

BY WOODWARD-CLYDE CONSULTANTS

Date: 3/28/86 Fri.

BEAM DATA

Beam No.	Station Number	Time of Day Started	Total Running Time	Depth (ft)	Withdrawal Rate (ft/min)	Surface Elevation	Tip Elevation
255	6+94.04	11:42	48.36	65.3	8.65	82.8	17.5
256	6+87.79	12:17	12.17	66.6	10.30	82.8	16.2
257	6+85.59	2:59	13.02	66.3	8.41	82.8	16.5
258	6+87.79	3:25	9.28	66.3	9.14	82.8	16.5

(Back of Beam at Station 6+85.21)

TODAY'S PRODUCTION:

Linear feet Today = 7.01

(From Station 6+92.22 to Station 6+85.21)

Square feet Today = 463.5

Average depth Today = 66.12

TOTALS TO DATE:

Linear Feet: 497.57

Square Feet: 31,037.1

DAILY REPORT

MITCHEL FIELD REMEDIATION - PHASE 1A

VIBRATORY BEAM CEMENT-BENTONITE WALL

CLIENT:TP INDUSTRIAL

BY WOODWARD-CLYDE CONSULTANTS

Date: 3/31/86 Mon.

BEAM DATA

Beam No.	Station Number	Time of Day Started	Total Running Time	Depth (ft)	Withdrawal Rate (ft/min)	Surface Elevation	Tip Elevation
259	6+84.59	9:31	26.06	66.3	10.81	82.8	16.5
260	6+83.30	10:44	9.15	66.0	10.94	82.8	16.8
261	6+82.01	11:10	12.07	66.0	11.09	82.8	16.8

(Back of Beam at Station 6+79.43)

TODAY'S PRODUCTION:

Linear feet Today = 5.78

(From Station 6+85.21 to Station 6+79.43)

Square feet Today = 382.0

Average depth Today = 66.10

TOTALS TO DATE:

Linear Feet: 503.35

Square Feet: 31,419.1

DAILY REPORT

MITCHEL FIELD REMEDIATION - PHASE 1A

VIBRATORY BEAM CEMENT-BENTONITE WALL

CLIENT:TP INDUSTRIAL

BY WOODWARD-CLYDE CONSULTANTS

Date: 4/1/86 Tues.

BEAM DATA

Beam No.	Station Number	Time of Day Started	Total Running Time	Depth (ft)	Withdrawal Rate (ft/min)	Surface Elevation	Tip Elevation
262	6+80.72	10:46	11.22	66.4	9.86	82.8	16.4
263	6+78.72	11:07	23.02	66.2	11.45	82.8	16.6
264	6+76.72	1:07	10.25	66.2	11.10	82.8	16.6
265	6+75.30	1:22	6.48	66.2	9.93	82.8	16.6
266	6+73.89	1:40	15.00	66.2	11.35	82.8	16.6

(Back of Beam at Station 6+69.89)

TODAY'S PRODUCTION:

Linear feet Today = 8.12

(From Station 6+79.43 to Station 6+71.31)

Square feet Today = 537.9

Average depth Today = 66.24

TOTALS TO DATE:

Linear Feet: 511.47

Square Feet: 31,957.0

DAILY REPORT

MITCHEL FIELD REMEDIATION - PHASE 1A

VIBRATORY BEAM CEMENT-BENTONITE WALL

CLIENT:TP INDUSTRIAL

BY WOODWARD-CLYDE CONSULTANTS

Date: 4/2/86 Weds.

BEAM DATA

Beam No.	Station Number	Time of Day Started	Total Running Time	Depth (ft)	Withdrawal Rate (ft/min)	Surface Elevation	Tip Elevation
267	6+72.47	1:47	26.52	66.2	10.01	82.8	16.6

(Back of Beam at Station 6+69.89)

TODAY'S PRODUCTION:

Linear feet Today = 1.42

(From Station 6+71.31 to Station 6+69.89)

Square feet Today = 94.0

Average depth Today = 66.20

TOTALS TO DATE:

Linear Feet: 512.89

Square Feet: 32,051.0

DAILY REPORT

MITCHEL FIELD REMEDIATION - PHASE 1A

VIBRATORY BEAM CEMENT-BENTONITE WALL

CLIENT:TP INDUSTRIAL

BY WOODWARD-CLYDE CONSULTANTS

Date: 4/3/86 Thurs.

BEAM DATA

Beam No.	Station Number	Time of Day Started	Total Running Time	Depth (ft)	Withdrawal Rate (ft/min)	Surface Elevation	Tip Elevation
268	4+08.50	8:44	7.12	66.1	11.20	80.1	14.0
269	4+10.77	9:21	10.22	65.7	10.19	80.1	14.4
270	4+13.04	9:40	15.01	65.8	10.47	80.1	14.3
271	4+15.30	10:26	13.38	65.3	10.53	80.2	14.9
272	4+17.57	10:57	15.55	65.3	9.84	80.2	14.9
273	4+19.83	11:34	20.08	65.1	10.44	80.2	15.1
274	4+22.09	1:17	12.38	65.9	11.04	80.2	14.3
275	4+24.12	1:41	15.00	65.7	11.14	80.3	14.6
276	4+26.14	2:03	22.05	65.4	9.43	80.3	14.9
277	4+28.14	4:32	5.59	65.4	10.93	80.3	14.9

Note a change—measuring to the front or left side of the beam

(Back or Right Side of Beam at Station 4+30.72)

TODAY'S PRODUCTION:

Linear feet Today = 21.72

(From Station 4+09.00 to Station 4+30.72)

Square feet Today = 1424.2

Average depth Today = 65.57

TOTALS TO DATE:

Linear Feet: 534.61

Square Feet: 33,475.2

DAILY REPORT

MITCHEL FIELD REMEDIATION - PHASE 1A

VIBRATORY BEAM CEMENT-BENTONITE WALL

CLIENT:TP INDUSTRIAL

BY WOODWARD-CLYDE CONSULTANTS

Date: 4/4/86 Fri.

BEAM DATA

Beam No.	Station Number	Time of Day Started	Total Running Time	Depth (ft)	Withdrawal Rate (ft/min)	Surface Elevation	Tip Elevation
278	4+30.14	2:48	11.40	65.3	7.39	80.3	15.0
279	4+32.59	3:17	13.00	65.3	10.88	80.4	15.1
280	4+35.04	3:39	17.46	65.2	11.70	80.4	15.2
281	4+36.87	4:09	18.30	65.1	13.20	80.5	15.4

(Back of Beam at Station 4+39.45)

TODAY'S PRODUCTION:

Linear feet Today = 8.73

(From Station 4+30.72 to Station 4+39.45)

Square feet Today = 569.4

Average depth Today = 65.22

TOTALS TO DATE:

Linear Feet: 543.34

Square Feet: 34,044.6

DAILY REPORT

MITCHEL FIELD REMEDIATION - PHASE 1A

VIBRATORY BEAM CEMENT-BENTONITE WALL

CLIENT:TP INDUSTRIAL

BY WOODWARD-CLYDE CONSULTANTS

Date: 4/7/86 Mon.

BEAM DATA

Beam No.	Station Number	Time of Day Started	Total Running Time	Depth (ft)	Withdrawal Rate (ft/min)	Surface Elevation	Tip Elevation
282	4+38.69	2:19	21.40	65.1	10.44	80.5	15.4
283	4+40.69	2:49	13.54	65.4	9.98	80.4	15.0
284	4+42.30	3:29	9.58	65.0	11.50	80.4	15.4
285	4+43.90	3:57	23.38	64.8	10.92	80.4	15.6
286	4+45.51	4:40	13.25	64.8	11.04	80.4	15.6

(Back of Beam at Station 4+48.09)

TODAY'S PRODUCTION:

Linear feet Today = 8.64

(From Station 4+39.45 to Station 4+48.09)

Square feet Today = 561.8

Average depth Today = 65.02

TOTALS TO DATE:

Linear Feet: 551.98

Square Feet: 34,606.4

DAILY REPORT

MITCHEL FIELD REMEDIATION - PHASE 1A

VIBRATORY BEAM CEMENT-BENTONITE WALL

CLIENT:TP INDUSTRIAL

BY WOODWARD-CLYDE CONSULTANTS

Date: 4/10/86 Thurs.

BEAM DATA

Beam No.	Station Number	Time of Day Started	Total Running Time	Depth (ft)	Withdrawal Rate (ft/min)	Surface Elevation	Tip Elevation
287	4+47.89	7:30*	—	65.0	—	80.4	15.4
288	4+49.39	9:32	9.13	65.6	12.50	80.5	14.9
289	4+51.56	9:55	11.55	65.6	10.09	80.6	15.0
290	4+53.56	3:29	7.25	65.7	10.65	80.7	15.0
291	4+55.80	3:43	15.14	65.8	10.20	80.8	15.0
292	4+58.05	4:08	11.05	66.0	9.30	80.8	14.8
293	4+60.29	4:28	18.00	65.9	9.98	80.9	15.0

(Back of Beam at Station 4+62.87)

* Completed Tuesday, 4/8/86

-- Not Reported

TODAY'S PRODUCTION:

Linear feet Today = 14.78

(From Station 4+48.09 to Station 4+62.87)

Square feet Today = 970.4

Average depth Today = 65.66

TOTALS TO DATE:

Linear Feet: 566.76

Square Feet: 35,576.8

DAILY REPORT

MITCHEL FIELD REMEDIATION - PHASE 1A

VIBRATORY BEAM CEMENT-BENTONITE WALL

CLIENT:TP INDUSTRIAL

BY WOODWARD-CLYDE CONSULTANTS

Date: 4/11/86 Fri.

BEAM DATA

Beam No.	Station Number	Time of Day Started	Total Running Time	Depth (ft)	Withdrawal Rate (ft/min)	Surface Elevation	Tip Elevation
294	4+62.38	10:12	5.55	65.9	11.80	80.9	15.0
295	4+64.47	10:24	9.08	66.2	11.22	81.0	14.8
296	4+66.79	10:42	13.36	66.3	10.47	81.1	14.8
297	4+68.55	12:44	21.00	65.9	9.17	81.2	15.3
298	4+70.30	1:19	11.30	65.8	10.88	81.3	15.5

(Back of Beam at Station 4+72.88)

TODAY'S PRODUCTION:

Linear feet Today = 10.01

(From Station 4+62.87 to Station 4+72.88)

Square feet Today = 660.9

Average depth Today = 66.02

TOTALS TO DATE:

Linear Feet: 576.77

Square Feet: 36,237.6

DAILY REPORT

MITCHEL FIELD REMEDIATION - PHASE 1A

VIBRATORY BEAM CEMENT-BENTONITE WALL

CLIENT:TP INDUSTRIAL

BY WOODWARD-CLYDE CONSULTANTS

Date: 4/14/86 Mon.

BEAM DATA

Beam No.	Station Number	Time of Day Started	Total Running Time	Depth (ft)	Withdrawal Rate (ft/min)	Surface Elevation	Tip Elevation
299	4+72.29	8:06	11.30	66.2	10.94	81.2	15.0
300	4+74.49	8:40	12.13	66.2	11.51	81.2	15.0
301	4+76.49	9:46	4.52	66.3	11.63	81.3	15.0
302*	4+78.14	10:00	10.15	66.3	13.72	81.3	15.0
303	4+79.79	11:35	11.50	66.6	14.80	81.4	14.8
304	4+81.99	2:13	10.14	66.7	13.80	81.4	14.7
305	4+84.19	3:34	9.00	66.9	10.09	81.5	14.6
306	4+85.95	3:51	7.35	66.9	10.04	81.5	14.6
307	4+87.71	4:06	7.16	67.1	11.25	81.6	14.5
308	4+89.47	4:20	14.23	67.0	9.62	81.6	14.6

(Back of Beam at Station 4+92.64)

* Switched to new beam - 3.17 feet flange to flange.

TODAY'S PRODUCTION:

Linear feet Today = 19.76

(From Station 4+72.88 to Station 4+92.64)

Square feet Today = 1316.4

Average depth Today = 66.62

TOTALS TO DATE:

Linear Feet: 596.53

Square Feet: 37,554.0

DAILY REPORT

MITCHEL FIELD REMEDIATION - PHASE 1A

VIBRATORY BEAM CEMENT-BENTONITE WALL

CLIENT:TP INDUSTRIAL

BY WOODWARD-CLYDE CONSULTANTS

Date: 4/15/86 Tues.

BEAM DATA

Beam No.	Station Number	Time of Day Started	Total Running Time	Depth (ft)	Withdrawal Rate (ft/min)	Surface Elevation	Tip Elevation
309	4+91.47	8:32	10.53	66.9	8.80	81.6	14.7
310	4+93.32	8:55	16.16	67.2	11.17	81.7	14.5
311	4+95.16	9:56	10.14	67.1	8.60	81.7	14.6
312	4+97.01	10:23	9.02	67.2	8.49	81.8	14.6
313	4+98.85	11:38	11.00	67.3	7.89	81.8	14.5
314	5+00.70	3:32	6.35	68.0	10.33	81.9	13.9
315	5+02.54	3:57	7.50	68.0	8.68	81.9	13.9
316	5+04.39	4:30	6.30	67.9	10.45	81.9	14.0

(Back of Beam at Station 5+07.56)

TODAY'S PRODUCTION:

Linear feet Today = 14.92

(From Station 4+92.64 to Station 5+07.56)

Square feet Today = 1006.4

Average depth Today = 67.45

TOTALS TO DATE:

Linear Feet: 611.45

Square Feet: 38,560.4

DAILY REPORT

MITCHEL FIELD REMEDIATION - PHASE 1A

VIBRATORY BEAM CEMENT-BENTONITE WALL

CLIENT:TP INDUSTRIAL

BY WOODWARD-CLYDE CONSULTANTS

Date: 4/16/86 Weds.

BEAM DATA

Beam No.	Station Number	Time of Day Started	Total Running Time	Depth (ft)	Withdrawal Rate (ft/min)	Surface Elevation	Tip Elevation
317	5+06.39	9:56	15.21	67.8	9.10	82.0	14.2
318	5+07.89	10:21	5.51	67.8	11.79	82.0	14.2
319	5+09.39	10:38	6.54	67.9	11.81	82.0	14.1
320	5+10.89	10:52	5.19	67.9	11.19	82.0	14.1
321	5+12.39	11:05	14.00	68.0	12.36	82.1	14.1
322	5+13.89	2:01	16.00	67.7	6.77	82.1	14.4
323	5+15.09	2:33	7.39	67.7	10.03	82.1	14.4
324	5+16.29	3:02	27.00	67.7	9.96	82.1	14.4
325	5+16.89	4:16	8.30	67.9	10.31	82.1	14.2
326	5+17.49	4:30	4.50	67.9	13.36	82.1	14.2

(Back of Beam at Station 5+20.66)

TODAY'S PRODUCTION:

Linear feet Today = 13.10

(From Station 5+07.56 to Station 5+20.66)

Square feet Today = 888.6

Average depth Today = 67.83

TOTALS TO DATE:

Linear Feet: 624.55

Square Feet: 39,449.0

DAILY REPORT

MITCHEL FIELD REMEDIATION - PHASE 1A

VIBRATORY BEAM CEMENT-BENTONITE WALL

CLIENT:TP INDUSTRIAL

BY WOODWARD-CLYDE CONSULTANTS

Date: 4/17/86 Thurs.

BEAM DATA

Beam No.	Station Number	Time of Day Started	Total Running Time	Depth (ft)	Withdrawal Rate (ft/min)	Surface Elevation	Tip Elevation
327	5+18.99	8:12	15.20	68.0	10.15	82.2	14.2
328	5+20.39	8:48	6.43	68.1	11.13	82.2	14.1
329	5+21.79	9:26	8.50	68.1	11.35	82.2	14.1
330	5+23.39	9:41	9.38	68.2	15.74	82.3	14.1
331	5+24.99	9:56	10.42	68.2	11.69	82.3	14.1
332	5+26.69	10:15	22.22	68.0	9.83	82.3	14.3
333	5+28.39	11:06	—	67.4	—	82.3	14.9

(Back of Beam at Station 5+31.56)

— Not Reported

TODAY'S PRODUCTION:

Linear feet Today = 10.90

(From Station 5+20.66 to Station 5+31.56)

Square feet Today = 741.2

Average depth Today = 68.00

TOTALS TO DATE:

Linear Feet: 635.45

Square Feet: 40,190.2

DAILY REPORT

MITCHEL FIELD REMEDIATION - PHASE 1A

VIBRATORY BEAM CEMENT-BENTONITE WALL

CLIENT:TP INDUSTRIAL

BY WOODWARD-CLYDE CONSULTANTS

Date: 5/1/86 Thurs

BEAM DATA

Beam No.	Station Number	Time of Day Started	Total Running Time	Depth (ft)	Withdrawal Rate (ft/min)	Surface Elevation	Tip Elevation
334	5+30.17	8:25*	4.56	66.7	10.45	82.4	15.7
335	5+32.17	10:45	11.05	66.5	8.31	82.4	15.9
336	5+33.83	12:43	13.10	66.3	13.26	82.4	16.1
337	5+35.50	1:19	14.17	66.4	13.98	82.5	16.1
338	5+37.16	1:51	26.25	66.4	7.38	82.5	16.1
339	5+39.16	3:49	11.58	65.9	9.88	82.5	16.6
340	5+40.31	4:12	22.53	65.7	10.54	82.5	16.8

(Back of Beam at Station 5+43.48)

* - Beam started 4/30/86

TODAY'S PRODUCTION:

Linear feet Today = 11.92

(From Station 5+31.56 to Station 5+43.48)

Square feet Today = 790.0

Average depth Today = 66.27

TOTALS TO DATE:

Linear Feet: 647.37

Square Feet: 40,980.2

DAILY REPORT

MITCHEL FIELD REMEDIATION - PHASE 1A

VIBRATORY BEAM CEMENT-BENTONITE WALL

CLIENT:TP INDUSTRIAL

BY WOODWARD-CLYDE CONSULTANTS

Date: 5/6/86 Tues.

BEAM DATA

Beam No.	Station Number	Time of Day Started	Total Running Time	Depth (ft)	Withdrawal Rate (ft/min)	Surface Elevation	Tip Elevation
341	6+04.66	8:40	2.10	66.9	11.15	82.3	15.4
342	6+02.38	11:15	11.30	66.6	10.52	82.3	15.7
343	6+00.11	11:45	21.25	66.6	12.89	82.4	15.8
344	5+98.11	1:19	24.30	66.6	12.11	82.4	15.8
345	5+96.11	3:15	--	66.4	14.76	82.4	16.0
346	5+94.27	4:31	23.38	66.5	17.81	82.5	16.0

(Back of beam at Station 5+91.66)

-- Not Reported

TODAY'S PRODUCTION:

Linear feet Today = 13.00

(From Station 6+04.66 to Station 5+91.66)

Square feet Today = 865.8

Average depth Today = 66.60

TOTALS TO DATE:

Linear Feet: 660.37

Square Feet: 41,846.0

DAILY REPORT

MITCHEL FIELD REMEDIATION - PHASE 1A

VIBRATORY BEAM CEMENT-BENTONITE WALL

CLIENT:TP INDUSTRIAL

BY WOODWARD-CLYDE CONSULTANTS

Date: 5/8/86 Thurs.

BEAM DATA

Beam No.	Station Number	Time of Day Started	Total Running Time	Depth (ft)	Withdrawal Rate (ft/min)	Surface Elevation	Tip Elevation
347	5+92.27	3:42	17.58	66.6	11.79	82.6	16.0
348	5+90.14	4:09	5.34	66.8	9.05	82.7	15.9
349	5+88.00	4:25	11.00	66.9	9.16	82.8	15.9
350	5+85.87	4:44	18.50	67.0	10.47	82.9	15.9

(Back of Beam at Station 5+83.26)

TODAY'S PRODUCTION:

Linear feet Today = 8.40

(From Station 5+91.66 to Station 5+83.26)

Square feet Today = 561.3

Average depth Today = 66.82

TOTALS TO DATE:

Linear Feet: 668.77

Square Feet: 42,407.3

DAILY REPORT

MITCHEL FIELD REMEDIATION - PHASE 1A

VIBRATORY BEAM CEMENT-BENTONITE WALL

CLIENT: TP INDUSTRIAL

BY WOODWARD-CLYDE CONSULTANTS

Date: 5/9/86 Fri.

BEAM DATA

Beam No.	Station Number	Time of Day Started	Total Running Time	Depth (ft)	Withdrawal Rate (ft/min)	Surface Elevation	Tip Elevation
351	5+83.87	10:40	7.36	67.3	9.61	83.0	15.7
352	5+81.37	11:00	9.25	67.3	12.24	83.1	15.8
353	5+78.87	11:17	9.15	67.3	11.70	83.1	15.8
354	5+76.27	11:47	10.20	67.4	10.64	83.2	15.8
355	5+73.77	12:57	17.02	67.5	9.40	83.3	15.8
356	5+72.47	3:35	18.58	67.3	9.61	83.3	16.0

(Back of Beam at Station 5+69.86)

TODAY'S PRODUCTION:

Linear feet Today = 13.40

(From Station 5+83.26 to Station 5+69.86)

Square feet Today = 902.5

Average depth Today = 67.35

TOTALS TO DATE:

Linear Feet: 682.17

Square Feet: 43,309.8

DAILY REPORT

MITCHEL FIELD REMEDIATION - PHASE 1A

VIBRATORY BEAM CEMENT-BENTONITE WALL

CLIENT: TP INDUSTRIAL

BY WOODWARD-CLYDE CONSULTANTS

Date: 5/12/86 Mon.

BEAM DATA

Beam No.	Station Number	Time of Day Started	Total Running Time	Depth (ft)	Withdrawal Rate (ft/min)	Surface Elevation	Tip Elevation
357	5+70.47	12:36	34.40	67.7	—	83.3	15.6
358	5+68.17	4:21	5.37	67.5	9.88	83.2	15.7
359	5+65.87	4:35	9.26	67.5	12.74	83.2	15.7
360	5+63.47	4:51	8.23	67.4	11.08	83.1	15.7

(Back of Beam at Station 5+60.86)

-- Not reported

TODAY'S PRODUCTION:

Linear feet Today = 9.00

(From Station 5+69.86 to Station 5+60.86)

Square feet Today = 607.7

Average depth Today = 67.52

TOTALS TO DATE:

Linear Feet: 691.17

Square Feet: 43,917.5

DAILY REPORT

MITCHEL FIELD REMEDIATION - PHASE 1A

VIBRATORY BEAM CEMENT-BENTONITE WALL

CLIENT:TP INDUSTRIAL

BY WOODWARD-CLYDE CONSULTANTS

Date: 5/13/86 Tues.

BEAM DATA

Beam No.	Station Number	Time of Day Started	Total Running Time	Depth (ft)	Withdrawal Rate (ft/min)	Surface Elevation	Tip Elevation
361	5+61.07	7:39	18.48	67.2	8.90	83.0	15.8
362	5+58.67	8:10	25.00	67.1	10.74	82.9	15.8
363	5+57.07	10:23	19.41	67.1	11.67	82.9	15.8
364	5+54.67	10:57	19.28	67.0	10.98	82.8	15.8
365	5+52.27	11:26	17.20	66.7	10.39	82.7	16.0
366	5+49.87	12:43	30.00	66.7	11.27	82.7	16.0
367	5+47.47	1:20	44.00	66.6	9.40	82.6	16.0
368	5+45.07	3:01	44.54	64.5	9.56	82.6	18.1

(Back of Beam at Station 5+42.48)

Wall was completed to Station 5+43.48 on 5/1/86

TODAY'S PRODUCTION:

Linear feet Today = 17.38

(From Station 5+60.86 to Station 5+43.48)

Square feet Today = 1157.7

Average depth Today = 66.61

TOTALS TO DATE:

Linear Feet: 708.55

Square Feet: 45,075.2

DAILY REPORT

MITCHEL FIELD REMEDIATION - PHASE 1A

VIBRATORY BEAM CEMENT-BENTONITE WALL

CLIENT:TP INDUSTRIAL

BY WOODWARD-CLYDE CONSULTANTS

Date: 5/14/86 Weds.

BEAM DATA

Beam No.	Station Number	Time of Day Started	Total Running Time	Depth (ft)	Withdrawal Rate (ft/min)	Surface Elevation	Tip Elevation
369	6+23.89	12:58	10.11	66.7	9.71	82.5	15.8
370	6+19.31	3:41	17.40	66.2	10.54	82.5	16.3
371	6+17.31	4:07	20.39	66.6	10.80	82.4	15.8
372	6+14.91	4:36	8.20	66.6	11.10	82.4	15.8

(Back of Beam at Station 6+12.30)

TODAY'S PRODUCTION:

Linear feet Today = 11.59

(From Station 6+23.89 to Station 6+12.30)

Square feet Today = 771.0

Average depth Today = 66.52

TOTALS TO DATE:

Linear Feet: 720.14

Square Feet: 45,846.3

DAILY REPORT

MITCHEL FIELD REMEDIATION - PHASE 1A

VIBRATORY BEAM CEMENT-BENTONITE WALL

CLIENT:TP INDUSTRIAL

BY WOODWARD-CLYDE CONSULTANTS

Date: 5/15/86 Thurs.

BEAM DATA

Beam No.	Station Number	Time of Day Started	Total Running Time	Depth (ft)	Withdrawal Rate (ft/min)	Surface Elevation	Tip Elevation
373	6+13.51	8:56	21.00	66.6	11.10	82.4	15.8
374	6+11.11	9:43	12.52	66.6	11.58	82.4	15.8
375	6+08.71	11:18	32.00	66.5	11.63	82.5	16.0
376#	6+06.31	#	#	66.3	#	82.3	16.0

- Beam 376 not completed, but will be counted on today's production.

(Back of Beam at Station 6+03.70)

Wall completed to Station 6+04.66 on 5/6/86

TODAY'S PRODUCTION:

Linear feet Today = 7.64

(From Station 6+12.30 to Station 6+04.66)

Square feet Today = 508.1

Average depth Today = 66.50

TOTALS TO DATE:

Linear Feet: 727.78

Square Feet: 46,354.3

DAILY REPORT

MITCHEL FIELD REMEDIATION - PHASE 1A

VIBRATORY BEAM CEMENT-BENTONITE WALL

CLIENT:TP INDUSTRIAL

BY WOODWARD-CLYDE CONSULTANTS

Date: 5/28/86 Weds.

BEAM DATA

Beam No.	Station Number	Time of Day Started	Total Running Time	Depth (ft)	Withdrawal Rate (ft/min)	Surface Elevation	Tip Elevation
377*	6+70.89	--	--	66.8	--	82.8	16.0
378	6+68.59	3:05	12.46	66.8	10.28	82.8	16.0
379	6+66.29	3:25	10.54	66.8	9.78	82.8	16.0

(Back of Beam at Station 6+63.75)

* Beam started 5/27/86.

-- Not Reported

Last completed Station 4/4/86 - 6+69.89.

TODAY'S PRODUCTION:

Linear feet Today = 6.14

(From Station 6+69.89 to Station 6+63.75)

Square feet Today = 410.2

Average depth Today = 66.80

TOTALS TO DATE:

Linear Feet: 733.92

Square Feet: 46,764.5

DAILY REPORT

MITCHEL FIELD REMEDIATION - PHASE 1A

VIBRATORY BEAM CEMENT-BENTONITE WALL

CLIENT:TP INDUSTRIAL

BY WOODWARD-CLYDE CONSULTANTS

Date: 5/29/86 Thurs.

BEAM DATA

Beam No.	Station Number	Time of Day Started	Total Running Time	Depth (ft)	Withdrawal Rate (ft/min)	Surface Elevation	Tip Elevation
380	6+64.19	10:46	12.25	66.8	10.83	82.8	16.0
381	6+63.24	11:09	22.49	— Redrilled and Redriven —			
381		1:06	7.00	66.8	9.50	82.8	16.0
382	6+60.94	2:46	21.44	66.9	10.94	82.9	16.0
383	6+58.64	3:17	11.40	— Redrilled and Redriven —			
383		4:30	8.18	66.9	11.21	82.9	16.0
384	6+56.34	4:44	3.53	66.9	10.97	82.9	16.0

(Back of Beam at Station 6+53.80)

TODAY'S PRODUCTION:

Linear feet Today = 9.95

(From Station 6+63.75 to Station 6+53.80)

Square feet Today = 665.2

Average depth Today = 66.86

TOTALS TO DATE:

Linear Feet: 743.87

Square Feet: 47,429.7

DAILY REPORT

MITCHEL FIELD REMEDIATION - PHASE 1A

VIBRATORY BEAM CEMENT-BENTONITE WALL

CLIENT:TP INDUSTRIAL

BY WOODWARD-CLYDE CONSULTANTS

Date: 5/30/86 Fri.

BEAM DATA

Beam No.	Station Number	Time of Day Started	Total Running Time	Depth (ft)	Withdrawal Rate (ft/min)	Surface Elevation	Tip Elevation
385	6+54.34	8:22	8.02	66.9	11.00	82.9	16.0
386	6+52.04	8:39	4.17	66.9	8.92	82.9	16.0
387	6+49.74	8:54	12.05	66.9	8.49	82.9	16.0
388	6+47.44	10:38	8.20	66.9	9.19	82.9	16.0
389	6+45.14	11:36	17.47	66.8	10.83	82.8	16.0
390	6+42.84	3:10	8.32	66.8	9.05	82.8	16.0
391	6+40.54	3:27	7.01	66.8	9.61	82.8	16.0
392	6+38.24	3:42	28.00	66.7	11.15	82.7	16.0
393	6+35.94	4:38	6.37	66.7	9.88	82.7	16.0

(Back of Beam at Station 6+33.40)

TODAY'S PRODUCTION:

Linear feet Today = 20.40

(From Station 6+53.80 to Station 6+33.40)

Square feet Today = 1363.2

Average depth Today = 66.82

TOTALS TO DATE:

Linear Feet: 764.27

Square Feet: 48,792.9

DAILY REPORT
MITCHEL FIELD REMEDIATION - PHASE 1A
VIBRATORY BEAM CEMENT-BENTONITE WALL
CLIENT:TP INDUSTRIAL
BY WOODWARD-CLYDE CONSULTANTS

Date: 5/31/86 Sat.

BEAM DATA

Beam No.	Station Number	Time of Day Started	Total Running Time	Depth (ft)	Withdrawal Rate (ft/min)	Surface Elevation	Tip Elevation
394	6+33.94	7:57	7.24	66.7	10.67	82.7	16.0
395	6+31.64	8:41	10.39	66.6	7.68	82.6	16.0
396	6+29.34	9:03	49.20	66.6	9.67	82.6	16.0
397	6+27.04	10:23	50.49	61.6	--	82.6	21.0

(Back of Beam at Station 6+24.50)
-- Not Reported

TODAY'S PRODUCTION:
Linear feet Today = 9.51
(From Station 6+33.40 to Station 6+23.89)
Square feet Today = 621.7
Average depth Today = 65.38

TOTALS TO DATE:
Linear Feet: 773.78

Square Feet: 49,414.6

DAILY REPORT

MITCHEL FIELD REMEDIATION - PHASE 1A

VIBRATORY BEAM CEMENT-BENTONITE WALL

CLIENT:TP INDUSTRIAL

BY WOODWARD-CLYDE CONSULTANTS

Date: 6/2/86 Mon.

BEAM DATA

Beam No.	Station Number	Time of Day Started	Total Running Time	Depth (ft)	Withdrawal Rate (ft/min)	Surface Elevation	Tip Elevation
398	-0+01.00	2:32	4.17	60.8	10.19	76.8	16.0
399	0+01.30	2:49	3.52	60.9	9.35	76.9	16.0
400	0+03.60	3:17	3.27	61.0	9.08	77.0	16.0
401	0+05.65	3:28	5.47	61.1	8.99	77.1	16.0
402	0+08.15	4:08	7.44	61.1	8.94	77.1	16.0
403	0+10.45	4:28	6.11	61.2	7.20	77.2	16.0
404	0+12.75	4:43	6.00	61.3	9.83	77.3	16.0
405	0+15.75	4:58	4.53	61.3	10.13	77.3	16.0

(Back of Beam at Station 0+17.59)

TODAY'S PRODUCTION:

Linear feet Today = 17.59

(From Station 0+00.00 to Station 0+17.59)

Square feet Today = 1074.5

Average depth Today = 61.09

TOTALS TO DATE:

Linear Feet: 791.37

Square Feet: 50,489.2

DAILY REPORT

MITCHEL FIELD REMEDIATION - PHASE 1A

VIBRATORY BEAM CEMENT-BENTONITE WALL

CLIENT:TP INDUSTRIAL

BY WOODWARD-CLYDE CONSULTANTS

Date: 6/3/86 Tues.

BEAM DATA

Beam No.	Station Number	Time of Day Started	Total Running Time	Depth (ft)	Withdrawal Rate (ft/min)	Surface Elevation	Tip Elevation
406	0+17.95	12:53	4.23	61.5	8.58	77.4	15.9
407	0+19.35	1:16	5.04	61.5	8.83	77.4	15.9
408	0+21.65	1:43	7.27	61.5	10.51	77.5	16.0
409	0+23.95	2:13	9.33	61.5	7.72	77.5	16.0
410	0+26.25	2:33	8.55	61.5	8.76	77.5	16.0
411	0+28.55	2:51	13.05	61.6	7.48	77.6	16.0
412	0+30.85	3:14	15.00	61.6	10.32	77.6	16.0
413	0+33.15	4:07	7.55	61.6	8.44	77.6	16.0
414	0+37.75	4:25	7.20	61.7	10.43	77.7	16.0

(Back of Beam at Station 0+40.29)

TODAY'S PRODUCTION:

Linear feet Today = 22.70

(From Station 0+17.59 to Station 0+40.29)

Square feet Today = 1397.3

Average depth Today = 61.56

TOTALS TO DATE:

Linear Feet: 814.07

Square Feet: 51,886.5

DAILY REPORT

MITCHEL FIELD REMEDIATION - PHASE 1A

VIBRATORY BEAM CEMENT-BENTONITE WALL

CLIENT:TP INDUSTRIAL

BY WOODWARD-CLYDE CONSULTANTS

Date: 6/4/86 Weds.

BEAM DATA

Beam No.	Station Number	Time of Day Started	Total Running Time	Depth (ft)	Withdrawal Rate (ft/min)	Surface Elevation	Tip Elevation
415	0+39.75	7:51	2.10	61.9	10.20	77.7	15.8
416	0+42.05	8:00	2.34	62.1	10.68	77.7	15.6
417	0+44.35	8:09	3.40	62.0	9.16	77.7	15.7
418	0+46.65	8:21	4.57	62.0	8.47	77.7	15.7
419	0+48.95	8:35	7.26	61.9	8.64	77.7	15.8
420	0+51.25	8:52	9.55	61.9	9.80	77.7	15.8
421	0+53.55	10:25	6.15	61.9	9.93	77.6	15.7
422	0+55.85	10:39	6.50	61.7	10.11	77.5	15.8
423	0+57.15	10:54	7.43	61.6	8.76	77.4	15.8
424	0+60.45	11:10	1.38	61.6	10.27	77.4	15.8
425	0+62.75	11:40	7.27	61.5	9.97	77.3	15.8
426	0+65.05	12:38	9.13	61.4	8.10	77.2	15.8
427	0+67.35	1:44	5.14	61.4	9.35	77.1	15.7
428	0+69.65	2:18	3.12	61.4	8.20	77.1	15.7
429	0+71.95	2:30	2.40	61.3	11.46	77.0	15.7
430	0+74.25	2:40	3.49	61.2	9.69	76.9	15.7
431	0+76.55	2:51	11.14	61.1	10.24	76.9	15.8
432	0+78.85	3:30	2.18	61.2	9.27	76.9	15.7

-Continued on the next page-

DAILY REPORT

MITCHEL FIELD REMEDIATION - PHASE 1A

VIBRATORY BEAM CEMENT-BENTONITE WALL

CLIENT:TP INDUSTRIAL

BY WOODWARD-CLYDE CONSULTANTS

Date: 6/4/86 Weds.

BEAM DATA

Beam No.	Station Number	Time of Day Started	Total Running Time	Depth (ft)	Withdrawal Rate (ft/min)	Surface Elevation	Tip Elevation
433	0+81.15	3:40	4.38	61.3	9.41	76.9	15.6
434	0+83.45	3:52	9.09	61.2	8.91	76.9	15.7
435	0+85.75	4:42	5.37	61.2	10.14	76.9	15.7
436	0+88.05	4:55	2.56	61.1	9.80	76.9	15.8

(Back of Beam at Station 0+90.59)

TODAY'S PRODUCTION:

Linear feet Today = 50.30

(From Station 0+40.29 to Station 0+90.59)

Square feet Today = 3095.5

Average depth Today = 61.54

TOTALS TO DATE:

Linear Feet: 864.37

Square Feet: 54,982.0

DAILY REPORT

MITCHEL FIELD REMEDIATION - PHASE 1A

VIBRATORY BEAM CEMENT-BENTONITE WALL

CLIENT:TP INDUSTRIAL

BY WOODWARD-CLYDE CONSULTANTS

Date: 6/5/86 Thurs.

BEAM DATA

Beam No.	Station Number	Time of Day Started	Total Running Time	Depth (ft)	Withdrawal Rate (ft/min)	Surface Elevation	Tip Elevation
437	0+90.05	8:23	2.55	61.2	8.74	76.9	15.7
438	0+92.35	8:34	6.42	61.1	8.63	76.9	15.8
439	0+94.67	8:51	4.55	61.0	9.13	76.8	15.8
440	0+96.97	9:04	5.30	61.0	8.78	76.8	15.8
441	0+99.27	9:34	7.21	60.9	10.32	76.7	15.8
442	1+01.57	9:49	12.04	60.8	10.95	76.6	15.8
443	1+03.87	12:40	9.23	60.8	13.08	76.6	15.8
444	1+06.15	12:55	4.39	60.6	10.48	76.5	15.9
445	1+08.45	1:06	11.43	60.6	8.46	76.5	15.9
446	1+10.75	1:27	10.53	60.5	8.44	76.4	15.9
447	1+13.05	1:45	8.22	60.5	11.52	76.4	15.9
448	1+15.35	2:12	10.17	60.4	9.69	76.3	15.9
449	1+17.65	4:06	20.55	60.4	10.23	76.3	15.9
450	1+19.95	4:56	5.24	60.3	10.19	76.2	15.9

(Back of Beam at Station 1+22.49)

TODAY'S PRODUCTION:

Linear feet Today = 31.90

(From Station 0+90.59 to Station 1+22.49)

Square feet Today = 1937.0

Average depth Today = 60.72

TOTALS TO DATE:

Linear Feet: 896.27

Square Feet: 56,919.0

DAILY REPORT

MITCHEL FIELD REMEDIATION - PHASE 1A

VIBRATORY BEAM CEMENT-BENTONITE WALL

CLIENT:TP INDUSTRIAL

BY WOODWARD-CLYDE CONSULTANTS

Date: 6/6/86 Fri.

BEAM DATA

Beam No.	Station Number	Time of Day Started	Total Running Time	Depth (ft)	Withdrawal Rate (ft/min)	Surface Elevation	Tip Elevation
451	1+88.10	11:35	1.37	61.9	9.78	77.4	15.5
452	1+92.35	11:51	9.11	61.6	8.97	77.4	15.8
453	1+86.10	1:08	13.40	61.3	8.88	77.3	16.0
454	1+83.80	2:47	6.30	61.6	10.78	77.3	15.7
455	1+81.50	3:13	7.31	61.3	10.16	77.3	16.0
456	1+79.20	3:28	5.04	61.3	9.86	77.3	16.0
457	1+76.90	3:41	10.15	61.3	8.80	77.3	16.0
458	1+74.60	4:44	5.05	61.3	9.65	77.3	16.0

(Back of Beam at Station 1+72.06)

TODAY'S PRODUCTION:

Linear feet Today = 20.29

(From Station 1+92.35 to Station 1+72.06)

Square feet Today = 1246.8

Average depth Today = 61.45

TOTALS TO DATE:

Linear Feet: 916.56

Square Feet: 58,165.8

DAILY REPORT

MITCHEL FIELD REMEDIATION - PHASE 1A

VIBRATORY BEAM CEMENT-BENTONITE WALL

CLIENT:TP INDUSTRIAL

BY WOODWARD-CLYDE CONSULTANTS

Date: 6/9/86 Mon.

BEAM DATA

Beam No.	Station Number	Time of Day Started	Total Running Time	Depth (ft)	Withdrawal Rate (ft/min)	Surface Elevation	Tip Elevation
459	1+72.60	8:24	2.35	61.4	10.90	77.2	15.8
460	1+70.30	8:34	2.56	61.4	8.35	77.2	15.8
461	1+68.00	8:47	3.40	61.4	10.18	77.2	15.8
462	1+65.70	8:58	5.39	61.4	10.29	77.2	15.8
463	1+63.40	9:33	4.35	61.3	9.55	77.2	15.9
464	1+61.10	9:45	7.10	61.3	10.60	77.2	15.9
465	1+58.80	10:59	2.02	61.3	10.27	77.2	15.9
466	1+56.50	11:24	4.09	61.4	10.21	77.2	15.8
467	1+54.20	11:41	5.31	61.3	10.24	77.2	15.9
468	1+51.90	12:45	5.55	61.3	9.43	77.2	15.9

- Continued on next page -

DAILY REPORT

MITCHEL FIELD REMEDIATION - PHASE 1A

VIBRATORY BEAM CEMENT-BENTONITE WALL

CLIENT:TP INDUSTRIAL

BY WOODWARD-CLYDE CONSULTANTS

Date: 6/9/86 Mon.

BEAM DATA

Beam No.	Station Number	Time of Day Started	Total Running Time	Depth (ft)	Withdrawal Rate (ft/min)	Surface Elevation	Tip Elevation
469	1+49.60	1:43	3.32	61.3	9.08	77.2	15.9
470	1+47.30	2:35	6.57	61.2	9.04	77.1	15.9
471	1+45.00	2:51	2.33	61.2	9.74	77.1	15.9
472	1+42.70	3:01	9.35	61.1	9.38	77.1	16.0
473	1+21.95	4:33	1.33	61.0	8.51	77.0	16.0
474	1+24.25	4:43	2.02	61.2	10.26	77.0	15.8
475	1+26.55	4:58	4.01	61.3	10.54	77.1	15.8
476	1+28.85	5:04	4.56	61.1	9.99	77.1	16.0
477	1+31.15	5:16	8.23	61.1	12.22	77.1	16.0
478	1+33.45	5:33	12.55	61.3	10.48	77.2	15.9

First Run - Back of Beam at Station 1+40.16

First Run - From Station 1+72.06 to Station 1+40.16

Second Run - Back of Beam at Station 1+35.99

Second Run - From Station 1+22.49 to Station 1+35.99

TODAY'S PRODUCTION:

Linear feet Today = 45.40

(From Station 1+72.06 to Station 1+35.99)

Square feet Today = 2781.4

Average depth Today = 61.26

TOTALS TO DATE:

Linear Feet: 961.96

Square Feet: 60,947.2

DAILY REPORT

MITCHEL FIELD REMEDIATION - PHASE 1A

VIBRATORY BEAM CEMENT-BENTONITE WALL

CLIENT:TP INDUSTRIAL

BY WOODWARD-CLYDE CONSULTANTS

Date: 6/10/86 Tues.

BEAM DATA

Beam No.	Station Number	Time of Day Started	Total Running Time	Depth (ft)	Withdrawal Rate (ft/min)	Surface Elevation	Tip Elevation
479	1+35.79	6:46	4.29	61.3	9.63	77.1	15.8
480	1+38.79	6:59	15.06	61.1	9.88	77.1	16.0
481	1+91.85	8:23	2.17	61.7	9.28	77.4	15.7
482	1+94.13	8:33	2.47	61.7	9.82	77.4	15.7
483	1+96.43	8:44	6.49	61.7	9.26	77.5	15.8
484	1+98.73	8:58	6.11	61.7	9.59	77.5	15.8
485	2+67.80	11:02	1.35	62.8	13.17	77.9	15.1
486	2+66.75	11:13	7.30	62.4	12.44	77.9	15.5
486a	2+66.65	11:27	2.59	62.4	10.95	77.9	15.5
487	2+71.55	11:38	10.15	62.4	12.40	77.9	15.5

Beam 485 - 2.25 in. batter in 4 feet

Beam 486 - a redrive of Beam 486 with a 1 in. batter in 4 feet

Beam 487 - a batter opposing that of Beam 485 with a 1 in. batter in 4 feet

- Continued on Next Page -

DAILY REPORT

MITCHEL FIELD REMEDIATION - PHASE 1A

VIBRATORY BEAM CEMENT-BENTONITE WALL

CLIENT:TP INDUSTRIAL

BY WOODWARD-CLYDE CONSULTANTS

Date: 6/10/86 Tues.

BEAM DATA

Beam No.	Station Number	Time of Day Started	Total Running Time	Depth (ft)	Withdrawal Rate (ft/min)	Surface Elevation	Tip Elevation
488	1+98.73	1:36	1.49	- Redrive of Beam 484 -			
489	2+00.73	1:44	2.53	61.7	10.23	77.5	15.8
490	2+03.03	1:54	7.46	61.7	9.87	77.5	15.8
491	2+05.33	2:30	5.18	61.8	10.10	77.6	15.8
492	2+07.63	2:43	8.15	61.8	10.45	77.6	15.8
493	2+09.93	4.35	8.45	61.9	8.42	77.6	15.7
494	2+12.23	4.53	5.15	61.8	10.59	77.6	15.8
495	2+14.53	5:08	8.09	61.9	10.61	77.7	15.8
496	2+16.83	5:22	6.20	62.0	10.75	77.7	15.7
497	2+19.13	5:35	8.40	61.9	10.37	77.7	15.8

First Run - From Station 1+35.99 to Station 1+40.16

Second Run - Back of Beam at Station 2+64.11

Second Run - From Station 2+71.55 to Station 2+64.11

Third Run - Back of Beam at Station 2+21.67

Third Run - From Station 1+92.35 to Station 2+21.67

TODAY'S PRODUCTION:

Linear feet Today = 40.93

(See the above notes)

Square feet Today = 2532.7

Average depth Today = 61.88

TOTALS TO DATE:

Linear Feet: 1002.89

Square Feet: 63,479.9

DAILY REPORT

MITCHEL FIELD REMEDIATION - PHASE 1A

VIBRATORY BEAM CEMENT-BENTONITE WALL

CLIENT:TP INDUSTRIAL

BY WOODWARD-CLYDE CONSULTANTS

Date: 6/11/86 Weds.

BEAM DATA

Beam No.	Station Number	Time of Day Started	Total Running Time	Depth (ft)	Withdrawal Rate (ft/min)	Surface Elevation	Tip Elevation
498	2+21.13	7:05	2.05	62.9	8.78	77.7	14.8
499	2+23.43	7:17	2.37	62.4	8.32	77.7	15.3
500	2+25.73	7:26	4.22	62.0	9.79	77.8	15.8
501	2+28.03	7:40	8.10	62.0	10.30	77.8	15.8
502	2+30.33	9:31	9.31	62.0	11.48	77.8	15.8
503	2+32.63	10:52	4.25	62.0	10.33	77.8	15.8
504	2+34.93	11:05	6.54	62.4	10.73	77.8	15.4
505	2+37.23	11:18	9.33	62.5	9.37	77.8	15.3
506	2+39.53	11:35	8.35	62.3	9.12	77.9	15.6
507	2+41.83	1:40	4.48	62.4	12.56	77.9	15.5
508	2+44.13	1:56	4.01	62.3	10.77	77.9	15.6
509	2+46.43	2:04	6.49	62.3	9.12	77.9	15.6
510	2+48.73	2:19	5.56	62.1	10.38	77.9	15.8
511	2+51.03	2:32	15.00	62.1	10.15	77.9	15.8
512	2+53.33	4:36	5.20	62.1	9.43	77.9	15.8
513	2+55.63	4:51	6.25	61.9	9.40	77.9	16.0
514	2+57.93	5:04	8.59	61.9	10.99	77.9	16.0
515	2+60.23	5:21	20.29	61.9	9.87	77.9	16.0

(Back of Beam at Station 2+62.77)

TODAY'S PRODUCTION:

Linear feet Today = 41.10

(From Station 2+21.67 to Station 2+62.77)

Square feet Today = 2556.2

Average depth Today = 62.19

TOTALS TO DATE:

Linear Feet: 1043.99

Square Feet: 66,036.1

DAILY REPORT

MITCHEL FIELD REMEDIATION - PHASE 1A

VIBRATORY BEAM CEMENT-BENTONITE WALL

CLIENT:TP INDUSTRIAL

BY WOODWARD-CLYDE CONSULTANTS

Date: 6/12/86 Thurs.

BEAM DATA

Beam No.	Station Number	Time of Day Started	Total Running Time	Depth (ft)	Withdrawal Rate (ft/min)	Surface Elevation	Tip Elevation
516	2+62.33	6:41	7.00	62.0	10.05	77.9	15.9
517	4+04.82	11:15	9.40	62.9	8.94	78.9	16.0
518	4+02.52	11:35	18.39	62.9	10.23	78.9	16.0
519	4+00.22	1:17	19.45	62.9	10.88	78.9	16.0
520	3+97.92	1:46	10.50	62.9	9.63	78.9	16.0
521	3+95.62	2:04	26.04	62.9	9.41	78.9	16.0
522	3+93.32	3:16	10.35	62.9	9.91	78.9	16.0
523	3+91.02	3:36	27.02	62.9	9.12	78.9	16.0
524	3+88.72	4:28	18.30	62.9	8.10	78.9	16.0

Beam 516 - Completes Wall Section to Utilities - Station 2+64.11 to Station 2+62.77

Second Run - Back of Beam at Station 3+86.18

TODAY'S PRODUCTION:

Linear feet Today = 19.25

(From Station 4+04.09 to Station 3+86.18)

Square feet Today = 1208.9

Average depth Today = 62.80

TOTALS TO DATE:

Linear Feet: 1063.24

Square Feet: 67,245.0

DAILY REPORT

MITCHEL FIELD REMEDIATION - PHASE 1A

VIBRATORY BEAM CEMENT-BENTONITE WALL

CLIENT:TP INDUSTRIAL

BY WOODWARD-CLYDE CONSULTANTS

Date: 6/13/86 Fri.

BEAM DATA

Beam No.	Station Number	Time of Day Started	Total Running Time	Depth (ft)	Withdrawal Rate (ft/min)	Surface Elevation	Tip Elevation
525	3+86.72	3:39	5.50	62.9	7.95	78.9	16.0
526	3+84.42	3:54	9.53	62.9	8.84	78.9	16.0
527	3+82.12	5:07	8.31	62.9	9.85	78.9	16.0

(Back of Beam at Station 3+79.58)

TODAY'S PRODUCTION:

Linear feet Today = 6.60

(From Station 3+86.18 to Station 3+79.58)

Square feet Today = 415.1

Average depth Today = 62.90

TOTALS TO DATE:

Linear Feet: 1069.84

Square Feet: 67,660.2

DAILY REPORT

MITCHEL FIELD REMEDIATION - PHASE 1A

VIBRATORY BEAM CEMENT-BENTONITE WALL

CLIENT:TP INDUSTRIAL

BY WOODWARD-CLYDE CONSULTANTS

Date: 6/14/86 Sat.

BEAM DATA

Beam No.	Station Number	Time of Day Started	Total Running Time	Depth (ft)	Withdrawal Rate (ft/min)	Surface Elevation	Tip Elevation
528	3+80.12	6:28	10.15	62.9	11.76	78.9	16.0
529	3+77.92	6;44	12.27	62.9	8.78	78.9	16.0
530	3+75.52	7:23	8.31	62.9	10.48	78.9	16.0
531	3+73.22	9:29	11.58	62.9	10.97	78.9	16.0
532	3+70.92	9:49	27.20	62.9	10.51	78.9	16.0
533	3+68.62	1:03	19.40	62.9	8.86	78.9	16.0
534	3+66.32	2:36	17.06	62.9	11.00	78.9	16.0
535	3+64.02	3:43	9.36	62.9	10.45	78.9	16.0

(Back of Beam at Station 3+61.48)

TODAY'S PRODUCTION:

Linear feet Today = 18.10

(From Station 3+79.58 to Station 3+61.48)

Square feet Today = 1138.5

Average depth Today = 62.90

TOTALS TO DATE:

Linear Feet: 1087.94

Square Feet: 68,798.7

DAILY REPORT

MITCHEL FIELD REMEDIATION - PHASE 1A

VIBRATORY BEAM CEMENT-BENTONITE WALL

CLIENT:TP INDUSTRIAL

BY WOODWARD-CLYDE CONSULTANTS

Date: 6/16/86 Mon.

BEAM DATA

Beam No.	Station Number	Time of Day Started	Total Running Time	Depth (ft)	Withdrawal Rate (ft/min)	Surface Elevation	Tip Elevation
536	3+62.02	6:40	6.53	62.9	9.75	78.9	16.0
537	3+60.36	6:57	9.46	62.9	10.57	78.9	16.0
538	3+58.06	7:38	11.20	62.9	9.93	78.9	16.0
539	3+55.76	12:56	22.30	62.9	5.62	78.9	16.0
540	3+53.46	2:03	9.50	62.9	9.93	78.9	16.0
541	3+51.16	2:23	7.57	62.9	10.63	78.9	16.0

(Back of Beam at Station 3+48.62)

TODAY'S PRODUCTION:

Linear feet Today = 12.86

(From Station 3+61.48 to Station 3+48.62)

Square feet Today = 808.9

Average depth Today = 62.90

TOTALS TO DATE:

Linear Feet: 1100.80

Square Feet: 69,607.6

DAILY REPORT

MITCHEL FIELD REMEDIATION - PHASE 1A

VIBRATORY BEAM CEMENT-BENTONITE WALL

CLIENT:TP INDUSTRIAL

BY WOODWARD-CLYDE CONSULTANTS

Date: 6/17/86 Tues.

BEAM DATA

Beam No.	Station Number	Time of Day Started	Total Running Time	Depth (ft)	Withdrawal Rate (ft/min)	Surface Elevation	Tip Elevation
542	3+27.52	7:24	2.25	63.3	9.22	78.9	15.6
543	3+25.25	8:34	3.35	63.2	8.09	78.9	15.7
544	3+22.95	9:04	6.25	63.3	10.07	78.9	15.6
545	3+20.65	9:34	19.52	63.1	8.97	78.9	15.8
546	3+18.35	10:55	5.01	63.1	9.71	78.9	15.8
547	3+16.05	11:15	6.45	63.1	10.94	78.9	15.8
548	3+13.75	11:47	5.45	63.1	10.85	78.9	15.8
549	3+11.45	12:56	8.05	63.1	10.18	78.9	15.8
550	3+09.15	1:12	9.17	63.1	8.91	78.9	15.8
551	3+06.85	1:46	7.51	63.1	9.26	78.9	15.8
552	3+04.55	2:14	12.20	63.1	10.23	78.9	15.8
553	3+02.25	2:35	12.55	63.1	9.33	78.9	15.8
554	2+99.95	3:31	11.25	63.1	11.37	78.9	15.8
555	2+97.62	4:03	8.25	63.1	9.47	78.9	15.8
556	2+95.32	4:21	18.05	63.1	10.66	78.9	15.8

(Back of Beam at Station 2+92.78)

TODAY'S PRODUCTION:

Linear feet Today = 34.74

(From Station 3+27.52 to Station 2+92.78)

Square feet Today = 2193.2

Average depth Today = 63.13

TOTALS TO DATE:

Linear Feet: 1135.54

Square Feet: 71,800.8

DAILY REPORT

MITCHEL FIELD REMEDIATION - PHASE 1A

VIBRATORY BEAM CEMENT-BENTONITE WALL

CLIENT:TP INDUSTRIAL

BY WOODWARD-CLYDE CONSULTANTS

Date: 6/18/86 Weds.

BEAM DATA

Beam No.	Station Number	Time of Day Started	Total Running Time	Depth (ft)	Withdrawal Rate (ft/min)	Surface Elevation	Tip Elevation
557	2+93.32	11:23	5.45	63.1	10.94	78.9	15.8
558	2+91.02	12:40	12.00	63.1	9.47	78.9	15.8
559	2+88.72	1:23	14.57	63.1	9.83	78.9	15.8
560	2+86.42	2:27	2.55	63.1	11.47	78.9	15.8
561	2+84.12	2:37	3.55	63.1	10.40	78.9	15.8
562	2+81.82	2:49	23.59	63.1	10.85	78.9	15.8
563	2+81.00	5:50	12.00	63.1	10.10	78.9	15.8

(Back of Beam at Station 2+77.83)

TODAY'S PRODUCTION:

Linear feet Today = 14.95

(From Station 2+92.78 to Station 2+77.83)

Square feet Today = 943.3

Average depth Today = 63.10

TOTALS TO DATE:

Linear Feet: 1150.49

Square Feet: 72,744.2

DAILY REPORT

MITCHEL FIELD REMEDIATION - PHASE 1A

VIBRATORY BEAM CEMENT-BENTONITE WALL

CLIENT:TP INDUSTRIAL

BY WOODWARD-CLYDE CONSULTANTS

Date: 6/19/86 Thurs.

BEAM DATA

Beam No.	Station Number	Time of Day Started	Total Running Time	Depth (ft)	Withdrawal Rate (ft/min)	Surface Elevation	Tip Elevation
564	2+78.60	7:06	31.30	62.9	6.43	78.9	16.0
565	2+76.20	7:42	15.20	63.1	11.23	78.9	15.8
566	2+73.80	9:24	12.40	63.1	7.16	78.9	15.8
567	3+49.12	11:09	4.25	62.9	9.23	78.9	16.0
568	3+46.62	11:36	13.20	62.9	9.20	78.9	16.0
569	3+44.12	1:05	9.40	62.9	9.96	78.9	16.0
570	3+41.62	3:11	11.50	62.9	8.98	78.9	16.0
571	3+39.12	3:47	11.00	63.0	10.62	78.9	15.9
572	3+36.62	4:19	13.32	62.9	9.55	78.9	16.0
573	3+34.12	5:00	13.50	63.1	11.51	78.9	15.8
574	3+31.62	5:23	26.00	62.9	10.91	78.9	16.0
575	3+29.12	5:55	8.21	62.9	11.27	78.9	16.0

First Run - From Station 2+77.83 to Station 2+71.55

Second Run - From Station 3+48.62 to Station 3+27.52

TODAY'S PRODUCTION:

Linear feet Today = 27.38

(See the above notes)

Square feet Today = 1723.8

Average depth Today = 62.96

TOTALS TO DATE:

Linear Feet: 1177.87

Square Feet: 74,468.0

DAILY REPORT

MITCHEL FIELD REMEDIATION - PHASE 1A

VIBRATORY BEAM CEMENT-BENTONITE WALL

CLIENT:TP INDUSTRIAL

BY WOODWARD-CLYDE CONSULTANTS

Date: 6/20/86 Fri.

BEAM DATA

Beam No.	Station Number	Time of Day Started	Total Running Time	Depth (ft)	Withdrawal Rate (ft/min)	Surface Elevation	Tip Elevation
576	10+75.86	8:38	11.20	60.9	9.88	76.9	16.0
577	10+73.06	9:11	5.25	60.9	9.02	76.9	16.0
578	10+70.26	9:50	8.55	60.8	8.62	76.8	16.0
579	10+67.46	10:23	14.45	60.8	10.73	76.8	16.0
580	10+64.66	10:57	8.12	60.7	9.87	76.7	16.0
581	10+61.86	11:36	17.40	60.7	10.09	76.7	16.0
582	10+59.06	12:49	7.30	60.6	9.32	76.6	16.0
583	10+56.26	1:17	9.00	60.6	10.66	76.6	16.0
584	10+53.46	1:46	14.09	60.5	10.34	76.5	16.0
585	10+51.66	2:23	13.10	60.5	10.20	76.5	16.0
586	10+47.86	3:05	12.00	60.5	9.21	76.5	16.0
587	10+45.06	3:44	14.45	60.6	10.27	76.6	16.0
588	10+42.26	4:44	7.17	60.6	11.33	76.6	16.0
589	10+41.05	4:56	12.20	60.6	9.75	76.6	16.0

(Back of Beam at Station 10+37.88)

TODAY'S PRODUCTION:

Linear feet Today = 35.98

(From Station 10+74.86 to Station 10+38.88)

Square feet Today = 2182.7

Average depth Today = 60.66

TOTALS TO DATE:

Linear Feet: 1213.85

Square Feet: 76,650.6

Appendix D

SUPPLEMENTAL
HEALTH AND SAFETY PROGRAM
MITCHEL FIELD REMEDIAL ACTION
PHASE 1A - CEMENT/BENTONITE CONTAINMENT WALL

TABLE OF CONTENTS

HEALTH AND SAFETY PROGRAM
MITCHEL FIELD REMEDIAL ACTION
PHASE 1A - CEMENT/BENTONITE CONTAINMENT WALL

1.0 INTRODUCTION

The first phase of the Mitchel Field Remedial Action includes the hydraulic control and reduction of volatile organics from within the identified source area. The hydraulic control of the source includes a vibrated beam cement/bentonite slurry wall to preclude horizontal movement in combination with a drainage field and well system to circulate water within the slurry wall enclosure.

The cement/bentonite slurry wall (Phase 1A) of the source control will be installed during the fall of 1985. The slurry wall will be a vibrated beam installation. Open excavation during Phase 1A will be limited to relocation of the 18-inch-diameter storm sewer drain from the MSBA garage, excavations to locate utilities and remove obstructions, and the excavation of an 18-inch deep starter trench for the vibrated beam slurry wall.

The health and safety program provides site specific guidance for the monitoring of air quality at the working area and at the exclusion area boundary. The program also includes guidelines for the monitoring of vibrations at key building and structure locations.

2.0 WORK AREA

The site plan for Phase 1A of the Mitchel Field remedial action is shown on Figure 1. The facilities and related areas associated with the construction of the cement/bentonite containment wall and relocation of the 18-inch-diameter storm sewer include the following:

- A designated Exclusion Area within the limits of which EPA Level C or D protection will be required
- A site administration trailer
- A tool/personnel change facility

Exclusion Area

The designated Exclusion Area encompasses the containment area where the slurry wall will be constructed and the storm sewer line relocated, Figure 1. The perimeter of this Exclusion Area will be marked with signs stating:

-- Danger --
Construction Area
Unauthorized Personnel
-- Keep Out --

The Exclusion Area boundary will be changed as construction progresses to enclose the active work areas maintaining access across the Phase 1 containment area for the buses when possible. The Exclusion Area will be enclosed by chain-link fence fastened to driven steel posts around the south and west sides. The Exclusion Area on the north and west sides, in the asphalt paved areas, will be enclosed by chain-link fence or snow fence mounted on movable supports.

Workers will donn the necessary protective clothing and equipment designated by the on-site engineer/health and safety officer before being permitted to enter the Exclusion Area. The personnel access point to the Exclusion Area is adjacent to the site support facilities, Figure 1. The on-site engineer will maintain a check-in and cneck-out record of all personnel in the Exclusion Area.

Personnel Cleanup and Decontamination

The personnel change facility will be located at the northwest corner of the Exclusion Area, Figure 1. Access to the trailer will be limited to authorized personnel only.

Personnel decontamination from the Exclusion Area will be performed in a contamination reduction corridor, which terminates at the personnel decontamination trailer. Contamination reduction will include a boot and glove wash, drum for disposal of Tyveks, and change area for the work force. All personnel leaving the Exclusion Area will pass through the decontamination process. Cloth coveralls, if worn, will be left at the site in the personnel change facility.

Decontamination will include washing of boots and gloves, disposal of Tyvek coveralls, and the removal of respirators. Respirators will be equipped with organic vapor GMC filters. The filters will be changed daily, and the respirator body cleaned using warm soap and water.

Construction of the Cement/Bentonite Wall

The construction of the cement/bentonite wall by the vibrating beam method will not allow volatile organic emissions. The only potential for volatile emissions will be during the excavation of the 18-inch deep starting trench for the vibrating beam. This trench will be backfilled with cement/ bentonite slurry as it is excavated to preclude the emission of volatile organics. At all times, the active area of trench construction will be closely monitored with organic vapor analyzing instruments as discussed in Section 3.0. In addition, gas chromatograph analysis of ambient air using a Century OVA with a gas chromatograph attachment will be performed during trenching operations if Level C protection is required for more than 30 minutes.

Relocation of the 18-Inch Storm Sewer

Volatile organic emissions may occur during the relocation of the storm sewer. The opened excavation will be closely monitored with organic vapor analyzers to ensure that low volatile organic concentrations are maintained and that appropriate personnel protection is used. Relocation of the storm sewer will begin under Level C health and safety conditions. During the early stages of the excavation, air quality will be monitored using a portable general scan OVA to determine if continued Level C is required. At the same time, the air emissions from the trench will be monitored with a Century OVA outfitted with a gas chromatograph attachment. This device will measure the actual levels of specific compounds present. The gas chromatograph OVA will be used for the first two days of trenching. Further monitoring will occur with the general scan OVA units, Section 4.0. The health and safety protection levels will be changed to Level D if the conditions in Section 4.0 are met. If Level C protection is required for more than 30 minutes, a gas chromatograph analysis of ambient air will be continued or restarted.

Equipment Decontamination

Equipment used to excavate in the ground will be decontaminated by washing with a high pressure washer prior to removal from the site. Wash water and soil from the decontamination will be left on the site within the enclosed Exclusion Area.

3.0 SITE MONITORING

Air Monitoring

Volatile organic vapors will be monitored with one portable flame ionization Organic Vapor Analyzer (OVA), and four permanently mounted flame ionization OVAs. The proposed locations of the four permanent OVAs are shown on Figure 1. The portable OVAs will be used in the areas of active construction to determine the appropriate personnel protection level.

The permanent OVAs at the Exclusion Area boundary will continuously record on a strip chart recorder. The permanent OVAs will be mounted on a post with a weather-tight enclosure and will be fueled by a hydrogen cylinder at each station.

All permanent OVA readings will be maintained in the project records.

Vibration Monitoring

During the installation of the vibrating beam, ground vibrations will be monitored and recorded using velocity transducers and a FM tape recorder or stripchart recorder. Vibrations will be monitored for one beam insertion daily, at each location. The recorded vibrations will be reviewed each day to determine and record the maximum particle velocities.

All vibration recordings will be maintained in the project records.

Weather Station

A weather station that records wind speed, wind direction, and temperature will be installed in the office trailer at the site. The weather records will be kept on at least a daily basis.

4.0 ACTION LEVELS

Air Quality

The air quality in the work areas will be monitored during excavation activities. If the organic vapor level exceeds 5 ppm above background for five minutes, or 30 ppm above background for one minute, the on-site engineer will direct everyone at the excavation area to donn their respirators.

If the Level C action level is attained for sustained periods exceeding 30 minutes, the construction activities will be re-evaluated to determine methods to reduce organic vapor levels. If the 30 ppm(v) action level is obtained for over 30 minutes at one of the perimeter OVAs, excavation activities will cease and contingency measures will be taken to reduce emissions.

If organic vapor levels exceed 100 ppm(v) for one minute, construction activities will cease, and the open excavation area will be covered immediately. The reason for the elevated concentrations will be determined, and contingent measures will be taken to reduce emissions.

Level B health and safety equipment will be available on-site, and will be worn if contingency actions require entry into an area where volatile organic levels exceed 100 ppm.

Vibrations

Daily vibration records will be analyzed to determine the peak particle velocities in all three directions (vertical, transverse, longitudinal). Velocities of less than 1.0 inches per second for frequencies of less than 20 cycles per second will be considered safe, 30 CFR Chapter VII. Velocities above these levels will be cause for adjustment of construction procedures to reduce vibrations, Section 6.0.

5.0 PERSONNEL PROTECTIVE EQUIPMENT

The following will be worn at all times by all personnel in the Exclusion Area:

- o Disposable Tyvek or reuseable cloth coveralls (as required by on-site engineer)
- o Boots - steel toe and shank, chemical resistant
- o Hard hat
- o Full-face respirator (carried at all times or worn upon engineer's direction)
- o Gloves

The personnel protective equipment will also include Scott positive pressure air packs for Level B protection, if required, to handle emergency or contingency situations (Section 7.0).

Prior to entering the Exclusion Area, persons will be supplied with and will don the appropriate safety equipment for the required level of protection determined by the on-site engineer.

The respirators will be Mine Safety Appliance (MSA) Comfo II full-face respirators with twin filter cartridges. The twin cartridges will be organic vapor GMC filters with particulate pre-filters. Personnel will donn their respirators upon the direction of the on-site engineer if an action level is surpassed.

All personnel will be required to have a pre-employment physical (including medical history, physical examination, audiogram, vision screen, blood test, EKG, X-ray, and urinalysis) before starting work at the site. Personnel will also be required to have a post-employment physical at completion or on leaving the project. Personnel covered under a regular company program meeting the above requirements will be excluded from the pre- and post-employment physicals.

6.0 CHAIN-OF-COMMAND AND EMERGENCY PROCEDURES

Chain-of-Command

The on-site director of health and safety will be the on-site engineer, Mr. Michael Strebeck. He will implement the safety program by maintaining surveillance of the volatile organic monitoring equipment to determine if an action level is reached, and by subsequently directing the appropriate actions to be taken. Mr. Strebeck will perform all the functions of the Health and Safety Officer, required in a health and safety program.

Mr. Strebeck will coordinate all health and safety activities with the site construction superintendent, Mr. Adelbert Knight and will inform him immediately if a contingency action level is reached. Both Mr. Strebeck and Mr. Knight have authority to stop work at anytime that a condition compromising the health and safety of on-site personnel arises.

Mr. Knight reports to Mr. Skoczen, the construction project manager, who is responsible for health and safety throughout the project operations. Mr. Strebeck will report to the corporate director of health and safety, Mr. Phillip Antommaria, on a regular basis.

The health and safety program, as implemented, will be reviewed by a certified industrial hygienist during the first week of the project. Modifications and improvements to the health and safety procedures will be implemented if requested by the industrial hygienist.

Emergency Procedures

A list of emergency numbers (police, ambulance, hospital), Table 1, will be posted at the job office for use in an emergency situation. Pre-arrangements will be made with the local emergency response staffs at these facilities.

In the instance of an emergency or injury, the personnel named on Table 1 will be contacted immediately after obtaining the local emergency response.

7.0 CONTINGENCY PLAN

Volatilization

If volatile organic levels at breathing level (five feet above ground surface) exceed 30 ppm(v) for 30 minutes or 100 ppm(v) for more than one minute, the on-going construction activity will be stopped, the construction area evacuated, and contingency measures will be considered. If stopping excavation activities does not decrease volatile organic levels, open excavations will be backfilled immediately to reduce soil-to-air contact. Operations in areas exceeding 100 ppm volatile organic levels will occur with Level B health and safety protection.

Contingency actions to reduce volatilization might include:

1. Backfilling of excavations
2. Covering of soil surfaces with plastic or tarps
3. Sealing of soil surfaces with a chemical sealant

If the volatile organic levels at one of the perimeter stations exceeds 30 ppm(v) for over 30 minutes, the work producing the emissions will cease and the construction procedure will be modified to reduce the levels.

Vibrations

If the peak particle velocities in any of the three principal directions exceeds 1.0 foot per second, contingency actions will be taken to reduce vibration levels. These steps might include:

1. Changing the vibration frequency or out-of-balance force on the vibratory hammer;
2. Stiffen the affected structure;
3. Detailed analysis of the vibrations on a spectrum analyzer.

Commander Oil, Figure 1, already has a contingency plan (Attachment 1) to handle oil spills at their storage terminal. This system uses an underground sump pit and surface grading to contain oil for removal and separation in an API oil separator. This system will provide containment of oil spills should they occur as a result of the vibrated beam slurry wall installation.

Appendix E

APPENDIX E
SUMMARY OF GROUT LABORATORY TESTING DATA
MITCHEL FIELD REMEDIATION - PHASE 1A
TP INDUSTRIAL, INC.
GARDEN CITY, NEW YORK

Sample No.	Date Sampled /Date Tested	Station	Natural* Water Content (Percent)	Unconfined Compression Strength* (psi)	Unconfined Compression Strain (%)	Dry* Unit Weight (pcf)	Permeability (X10-7 cm/sec)
1	1-13-86/2-13-86	10+97	380	7.2	1.4	14.6	--
3	1-14-86/2-13-86	10+83	348	6.0	1.7	--	--
4	1-14-86/2-13-86	10+83	360 (294)	--	--	15.4 (18.8)	6.5
5	1-21-86/2-19-86	11+11	382	3.9	1.9	14.5	--
7	1-22-86/2-21-86	11+27	398	3.1	1.4	14.1	--
9	1-30-86/2-28-86	11+51	378	5.4	1.6	14.7	--
10	1-30-86/2-28-86	11+51	332 (272)	(19.0)	1.1	16.6 (19.5)	9.1
11	2-4-86/3-5-86	11+78	417	1.4	3.1	13.6	--
14	2-10-86/3-10-86	12+05	491	1.3	1.3	11.7	--
15	2-24-86/3-24-86	10+79	386	1.7	1.3	14.5	--
18	2-27-86/3/28/86	10+27	344	6.0	1.3	16.0	--
19	2-28-86/3-28-86	NCO+06	372	4.2	1.3	14.9	--
20	3-4-86/4-3-86	NCO+28	366	5.0	1.5	15.1	--
22	3-5-86/4-3-86	9+47	433	3.5	1.7	13.0	--
24	3-6-86/4-6-86	9+39	434 (305)	--	--	13.1 (17.7)	7.1
25	3-6-86/4-6-86	9+39	423	3.2	2.0	13.3	--
26	3-7-86/4-7-86	9+33	437	2.8	1.7	13.0	--
28	3-10-86/4-8-86	9+06	384	3.8	1.5	14.5	--
29	3-12-86/4-10-86	8+78	373	4.9	1.6	14.9	--
31	3-13-86/4-12-86	8+55	407	4.2	1.3	13.7	--
17	2-27-86/4-12-86	10+27	342 (289)	(20.6)	1.2	16.1 (18.8)	7.0
33	3-17-86/4-18-86	8+39	478	1.9	1.3	11.9	--
36	3-18-86/4-18-86	7+79	432 (340)	(21.5)	1.4	13.1 (16.3)	17.0
38	3-19-86/4-18-86	8+09	446	4.4	1.3	12.6	--
40	3-20-86/4-18-86	8+27	358	4.7	1.5	14.8	--
42	3-21-86/4-22-86	7+55	398	4.2	1.4	14.1	--
43	3-24-86/4-22-86	7+40	413	4.2	1.1	13.5	--
45	3-25-86/4-23-86	7+20	408 (308)	--	--	13.8 (17.6)	8.3
47	3-25-86/4-23-86	7+20	390	3.8	1.5	14.3	--
49	3-27-86/4-25-86	6+95	428	3.6	1.4	13.1	--
51	3-28-86/4-25-86	6+85	400	3.8	1.6	14.0	--
52	4-3-86/5-2-86	4+26	481	1.8	2.0	11.8	--
54	4-7-86/5-7-86	4+46	457 (351)	--	--	12.4 (17.0)	8.8
56	4-10-86/5-9-86	4+56	489	1.9	2.3	11.7	--
58	4-11-86/5-9-86	4+69	469	1.4	1.7	11.3	--
61	4-14-86/5-15-86	4+82	447	2.4	1.5	12.3	--
62	4-15-86/5-15-86	4+97	424	2.8	1.9	13.3	--
63	4-15-86/5-15-86	4+97	433 (311)	--	--	13.1 (17.6)	7.6

* Numbers in () are results of tests run after consolidation (at 16 psi for permeability).

APPENDIX E (cont'd)
SUMMARY OF GROUT LABORATORY TESTING DATA
MITCHEL FIELD REMEDIATION - PHASE 1A
TP INDUSTRIAL, INC.
GARDEN CITY, NEW YORK

Sample No.	Date Sampled /Date Tested	Station	Natural* Water Content (Percent)	Unconfined Compression Strength* (psi)	Strain (%)	Dry* Unit Weight (pcf)	Permeability (X10-7 cm/sec)
64	4-16-86/5-17-86	5+12	448	2.2	1.9	12.7	--
66	4-17-86/5-19-86	5+23	370	5.7	1.4	14.0	--
68	5-9-86/6-9-86	5+73	432	1.9	2.7	13.2	--
70	5-12-86/6-12-86	5+68	453	2.8	1.8	12.6	--
72	5-13-86/6-13-86	5+50	456	3.6	2.3	12.4	--
74	5-15-86/6-16-86	6+08	430	4.0	1.8	13.1	--
75	5-15-86/6-18-86	6+08	444 (311)	--	--	12.8 (17.1)	9.2
76	5-30-86/6/30/86	6+45	454	3.6	.9	12.5	--
78	6-2-86/7-1/86	0+08	452	.8	4.6	12.6	--
80	6-3-86/7-1-86	0+29	496	1.3	2.3	11.6	--
82	6-4-86/7-3-86	0+54	454	1.7	3.2	12.5	--
84	6-5-86/7-3-86	1+06	431	2.6	1.5	13.1	--
86	6-6-86/7-7-86	1+84	481	1.9	2.5	11.8	--
87	6-9-86/7-9-86	1+56	529	1.0	3.0	10.9	--
89	6-10-86/7-9-86	2+72	458	2.2	2.4	12.5	--
91	6-11-86/7-11-86	2+37	460	4.2	1.8	12.3	--
93	6-11-86/7-11-86	3+98	514	1.7	2.3	11.1	--
8	1-22-86/2-21-86	11+27	371 (323)	--	--	14.9 (16.9)	9.7
95	6-17-86/7-18-86	3+23	457	2.2	2.3	12.5	--
97	6-19-86/7-21-86	2+74	484	2.4	2.5	11.8	--
99	6-20-86/7-21-86	10+59	427	2.8	1.5	13.3	--
100	6-20-86/7-22-86.	10+59	443 (300)	--	--	12.9 (18.3)	10.0
85	6-5-86/7-7-86	1+06	439 (305)	--	--	12.9 (17.6)	6.5

* Numbers in () are results of tests run after consolidation (at 16 psi for permeability).

Appendix F

APPENDIX F
SUMMARY OF DAILY GROUT TAKE
MITCHEL FIELD REMEDIATION-PHASE 1A
GARDEN CITY, NEW YORK

Date	From Station	To Station	Daily Linear Feet*	Daily Number of Batches	Daily Volume of Grout Injected (Cu.Yds.)	Cumulative Linear Feet*	Cumulative Volume of Grout Injected (Cu. Yds.)	Average Depth (Feet)	Estimated Volume of Starter Trench and Waste (Cu. Yds.)	Volume of Beam Void (Cu. Yds.)	Daily Total of Grout Volume into Sides (Est.) (Cu. Yds.)	Estimated Average Daily Side Penetration (100% Poro.) (Feet)	Estimated Average Daily Side Penetration (Poro.=.3) (Feet)	Daily Grout Take per Lineal Foot (CY/ft.)
1/9/86	9+86.83	9+92.29*	5.46	6	18	5.46	18	63.6	1.2	4.1	12.6	.50	1.68	3.1
1/10/86	9+92.29	9+94.79*	2.50	5	9	7.96	27	63.6	.6	1.9	6.5	.57	1.90	3.4
1/13/86	11+03.59	10+84.44*	16.33	13	39	24.29	66	60.8	3.6	11.8	23.5	.33	1.09	2.2
1/14/86	10+84.44	10+79.56	4.88	7	15	29.17	81	61.7	1.1	3.6	10.3	.47	1.58	2.8
1/16/86	10+97.90	11+01.07*	3.17	5	6	32.34	87	61.6	.7	2.3	3.0	.21	.70	1.7
1/21/86	11+01.07	11+14.31	13.24	9	22	45.58	109	60.3	2.9	9.5	9.5	.16	.55	1.4
1/22/86	11+14.31	11+28.98	14.67	7	21	60.25	130	60.4	3.3	10.6	7.2	.11	.37	1.2
1/23/86	11+28.98	11+33.69	4.71	4	12	64.96	142	59.8	1.0	3.4	7.6	.37	1.24	2.3
1/31/86	11+33.69	11+51.03	17.34	10	30	82.30	172	60.0	3.8	12.4	13.7	.18	.61	1.5
2/3/86	11+51.03	11+66.37	15.34	9	24	97.64	196	60.1	3.4	11.0	9.6	.14	.48	1.3
2/6/86	11+66.37	11+81.78	15.41	8	24	113.05	220	60.2	3.4	11.0	9.5	.14	.47	1.3
2/10/86	12+22.25	11+91.91*	30.34	14	42	143.39	262	61.7	6.7	22.3	12.9	.10	.32	1.2
2/12/86	11+91.91	11+81.78	10.13	8	24	153.52	286	60.0	2.2	7.2	14.5	.33	1.10	2.1
2/24/86	10+79.56	10+74.86	4.70	6	15	158.22	301	60.2	1.0	3.4	10.6	.52	1.72	3.0
2/27/86	9+93.70	10+26.59*	32.89	18	54	191.11	355	61.3	7.3	24.0	22.6	.16	.52	1.4
2/28/86	10+26.59	NC0+08.50*	21.79	14	42	212.90	397	61.4	4.8	16.0	21.2	.22	.73	1.7
3/1/86	NC0+08.50	NC0+17.63	9.13	6	15	222.03	412	62.2	2.0	6.8	6.2	.15	.50	1.4
3/4/86	NC0+17.63	NC0+30.21*	12.58	5	15	234.61	427	61.8	2.8	9.3	2.9	.05	.17	1.0
3/5/86	9+56.77	9+42.40*	14.37	6	24	248.98	451	62.2	3.2	10.7	10.1	.16	.52	1.4
3/6/86	9+42.40	9+34.65	7.75	6	16	256.73	467	62.2	1.7	5.7	8.5	.24	.82	1.8
3/7/86	9+34.65	9+18.99	15.66	7	28	272.39	495	62.3	3.5	11.6	12.9	.18	.61	1.6
3/10/86	9+18.99	9+01.32	17.67	10	36	290.06	531	62.1	3.9	13.1	19.0	.24	.80	1.8
3/11/86	9+01.32	8+96.07	5.25	4	16	295.31	547	62.1	1.2	3.9	10.9	.46	1.55	2.8
3/12/86	8+96.07	8+67.03	29.04	12	48	324.35	595	61.8	6.4	21.4	20.2	.16	.52	1.4
3/13/86	8+67.03	8+45.05	21.98	10	40	346.33	635	62.1	4.9	16.3	18.8	.19	.64	1.6
3/17/86	8+45.05	8+31.12	13.93	7	21	360.26	656	62.8	3.1	10.4	7.5	.12	.39	1.3
3/18/86	7+65.02	7+87.17	22.15	9	36	382.41	692	63.2	4.9	16.7	14.4	.14	.47	1.4
3/19/86	7+87.17	8+11.58	24.41	12	48	406.82	740	63.3	5.4	18.4	24.1	.22	.72	1.7
3/20/86	8+11.58	8+31.12	19.54	10	40	426.36	780	62.9	4.3	14.6	21.0	.24	.79	1.8
3/21/86	7+65.02	7+50.63	14.39	7	28	440.75	808	66.0	3.2	11.3	13.5	.20	.65	1.7
3/24/86	7+50.63	7+30.60*	20.03	12	44	460.78	852	66.0	4.4	15.8	23.8	.25	.83	2.0
3/25/86	7+33.77	7+17.44*	16.33	9	36	477.11	888	66.7	3.6	13.0	19.4	.24	.82	2.0

* Overlap for corner included for calculation of grout take.

APPENDIX F (cont'd)
SUMMARY OF DAILY GROUT TAKE
MITCHEL FIELD REMEDIATION-PHASE 1A
GARDEN CITY, NEW YORK

Date	From Station	To Station	Daily Linear Feet*	Daily Number of Batches	Daily Volume of Grout Injected (Cu.Yds.)	Cumulative Linear Feet*	Cumulative Volume of Grout Injected (Cu. Yds.)	Average Depth (Feet)	Estimated Volume of Starter Trench and Waste (Cu. Yds.)	Volume of Beam Void (Cu. Yds.)	Daily Total of Grout Volume Into Sides (Est.) (Cu. Yds.)	Estimated Average Daily Side Penetration (100% Poro.) (Feet)	Estimated Average Daily Side Penetration (Poro.=.3) (Feet)	Daily Grout Take per Lineal Foot (CY/ft.)
3/26/86	7+17.44	7+05.22	12.22	7	28	489.33	916	66.4	2.7	9.7	15.6	.26	.88	2.1
3/27/86	7+05.22	6+92.22	13.00	7	28	502.33	944	65.8	2.9	10.2	14.9	.24	.80	1.9
3/28/86	6+92.22	6+85.21	7.01	7	28	509.34	972	66.1	1.6	5.5	20.9	.62	2.08	3.8
3/31/86	6+85.21	6+79.43	5.78	3	12	515.12	984	66.1	1.3	4.6	6.2	.22	.74	1.8
4/1/86	6+79.43	6+71.31	8.12	8	28	523.24	1012	66.2	1.8	6.4	19.8	.51	1.69	3.2
4/2/86	6+71.31	6+69.89	1.42	2	6	524.66	1018	66.2	.3	1.1	4.6	.67	2.23	4.0
4/3/86	4+08.50	4+30.72*	22.22	11	44	546.88	1062	65.6	4.9	17.4	21.7	.20	.68	1.8
4/4/86	4+30.72	4+39.45	8.73	6	22	555.61	1084	65.2	1.9	6.8	13.3	.32	1.07	2.3
4/7/86	4+39.45	4+48.08	8.64	4	28	564.25	1112	65.0	1.9	6.7	19.4	.48	1.59	3.0
4/10/86	4+48.08	4+62.87	14.78	6	24	579.03	1136	65.7	3.3	11.6	9.1	.13	.43	1.4
4/11/86	4+62.87	4+72.88	10.01	4	16	589.04	1152	66.0	2.2	7.9	5.9	.12	.41	1.4
4/14/86	4+72.88	4+92.64	19.76	11	44	608.80	1196	66.6	4.4	15.7	23.9	.25	.84	2.0
4/15/86	4+92.64	5+07.56	14.92	9	36	623.72	1232	67.4	3.3	12.0	20.6	.28	.94	2.2
4/16/86	5+07.56	5+20.66	13.10	8	32	636.82	1264	67.8	2.9	10.6	18.5	.29	.96	2.2
4/17/86	5+20.66	5+31.56	10.90	8	32	647.72	1296	68.0	2.4	8.8	20.7	.38	1.29	2.7
5/1/86	5+31.56	5+43.48	11.92	9	36	659.64	1332	66.3	2.6	9.4	23.9	.42	1.39	2.8
5/6/86	6+04.66	5+91.66	13.00	7	28	672.64	1360	66.6	2.9	10.3	14.8	.24	.78	1.9
5/8/86	5+91.66	5+83.26	8.40	3	12	681.04	1372	66.8	1.9	6.7	3.4	.08	.28	1.2
5/9/86	5+83.26	5+69.86	13.40	6	24	694.44	1396	67.4	3.0	10.8	10.2	.16	.52	1.6
5/12/86	5+69.86	5+60.86	9.00	7	28	703.44	1424	67.5	2.0	7.3	18.7	.42	1.42	2.9
5/13/86	5+60.86	5+43.48	17.38	9	36	720.82	1460	66.6	3.9	13.8	18.3	.22	.73	1.8
5/14/86	6+23.89	6+12.30	11.59	6	24	732.41	1484	66.5	2.6	9.2	12.2	.22	.73	1.8
5/15/86	6+12.30	6+04.66	7.64	6	16	740.05	1500	66.5	1.7	6.1	8.2	.22	.75	1.9
5/28/86	6+69.89	6+63.75	6.14	4	16	746.19	1516	66.8	1.4	4.9	9.7	.33	1.09	2.4
5/29/86	6+63.75	6+53.80	9.95	5	20	756.14	1536	66.9	2.2	7.9	9.8	.20	.68	1.8
5/30/86	6+53.80	6+33.40	20.40	8	32	776.54	1568	66.8	4.5	16.3	11.2	.11	.38	1.3
5/31/86	6+33.40	6+23.89	9.51	5	20	786.05	1588	65.4	2.1	7.4	10.5	.23	.77	1.9
6/2/86	-0+01.00	0+17.59	18.59	5	20	804.64	1608	61.1	4.1	13.5	2.3	.03	.09	.8
6/3/86	0+17.59	0+40.29	22.70	7	28	827.34	1636	61.6	5.0	16.7	6.3	.06	.21	1.0
6/4/86	0+40.29	0+90.59	50.30	16	64	877.64	1700	61.5	11.2	36.9	15.9	.07	.24	1.0
6/5/86	0+90.59	1+22.49	31.90	14	56	909.54	1756	60.7	7.1	23.1	25.8	.18	.62	1.5
6/6/86	1+92.35	1+72.06	20.29	5	20	929.83	1776	61.4	4.5	14.9	.6	.01	.02	.8

* Overlap at corner included for calculation of grout take.

APPENDIX F (cont'd)
SUMMARY OF DAILY GROUT TAKE
MITCHEL FIELD REMEDIATION-PHASE 1A
GARDEN CITY, NEW YORK

Date	From Station	To Station	Daily Linear Feet*	Daily Number of Batches	Daily Volume of Grout Injected (Cu.Yds.)	Cumulative Linear Feet*	Cumulative Volume of Grout Injected (Cu. Yds.)	Average Depth (Feet)	Estimated Volume of Starter Trench and Waste (Cu. Yds.)	Volume of Beam Void (Cu. Yds.)	Daily Total of Grout Volume into Sides (Est.) (Cu. Yds.)	Estimated Average Daily Side Penetration (100% Poro.) (Feet)	Estimated Average Daily Side Penetration (Poro.=.3) (Feet)	Daily Grout Take per Lineal Foot (CY/ft.)
6/9/86	1+72.06	1+40.16												
	1+22.35	1+35.99	45.40	14	56	975.23	1832	61.3	10.1	33.2	12.8	.06	.21	1.0
6/10/86	1+35.99	1+40.16												
	2+71.55	2+64.11												
	1+92.35	2+21.67	40.93	16	64	1016.16	1896	61.9	9.1	30.2	24.7	.13	.45	1.3
6/11/86	2+21.67	2+62.77	41.10	14	56	1057.26	1952	62.2	9.1	30.5	16.4	.09	.30	1.1
6/12/86	2+64.11	2+62.11												
	4+04.82	3+86.18	19.25	9	32	1076.51	1984	62.8	4.3	14.4	13.3	.15	.51	1.4
6/13/86	3+86.18	3+79.58	6.60	4	16	1083.11	2000	62.9	1.5	5.0	9.6	.32	1.06	2.2
6/14/86	3+79.58	3+61.48	18.10	8	32	1101.21	2032	62.9	4.0	13.6	14.4	.17	.58	1.5
6/16/86	3+61.48	3+48.62	12.86	6	20	1114.07	2052	62.9	2.8	9.6	7.5	.13	.43	1.3
6/17/86	3+27.52	2+92.78	34.74	12	48	1148.81	2100	63.1	7.7	26.2	14.1	.09	.30	1.2
6/18/86	2+92.78	2+77.83	14.95	5	20	1163.76	2120	63.1	3.3	11.2	5.4	.08	.26	1.1
6/19/86	2+77.83	2+71.55												
	3+48.62	3+27.52	27.38	12	48	1191.14	2168	63.0	6.1	20.6	21.3	.17	.57	1.5
6/20/86	10+74.86	10+38.88	35.98	15	60	1227.12	2228	60.7	8.0	26.0	26.0	.16	.55	1.4
Average grout take for the entire wall =						1227.12	2228	62.5	272.7	914.3	1041.0	.19	.63	1.6

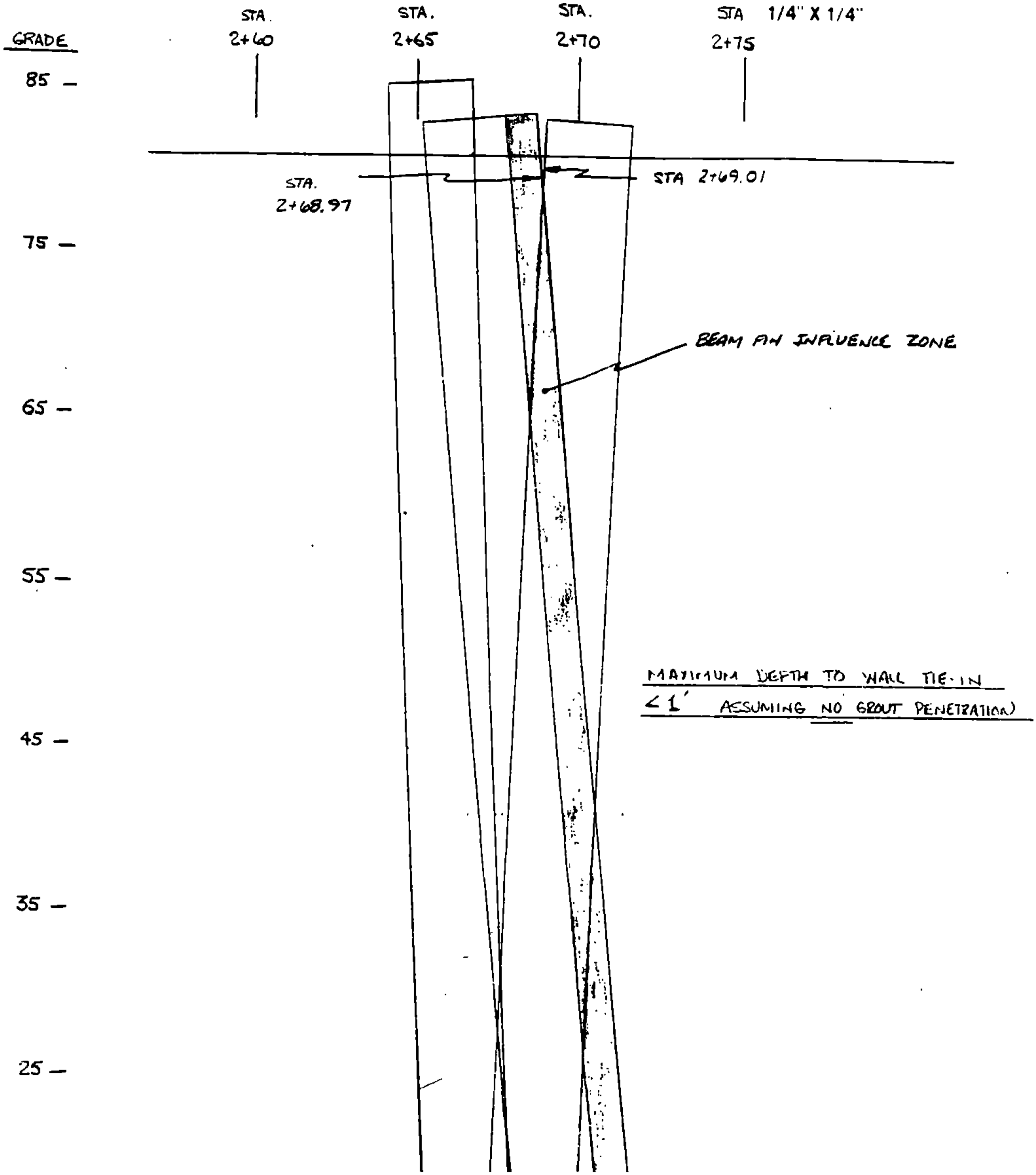
Appendix G

CanonieEngineers

By MJS Date 6-24-86 Subject UTILITY CROSSING STA ~ 2+68 Sheet No. 1 of 1

Chkd. By ____ Date ________ INSTALLED 6-10-86 Proj. No. 85096P

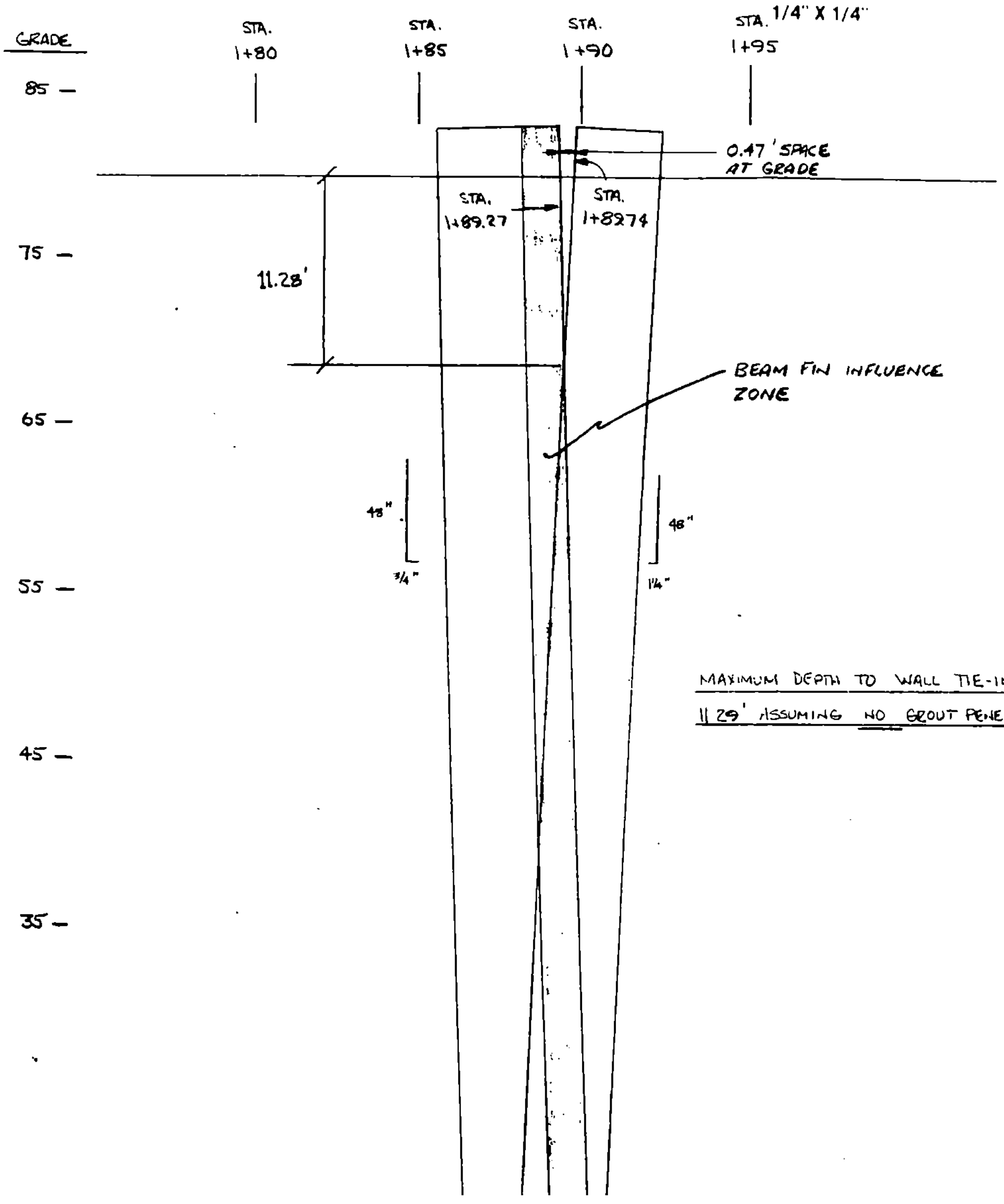
1/4" X 1/4"



CanonieEngineers

By MJS Date 6-24-86 Subject UTILITY CROSSING STA. ~ 1+89 Sheet No. 1 of 1

Chkd. By ____ Date ________ INSTALLED 6-06-86 Proj. No. 85096P



MAXIMUM DEPTH TO WALL TIE-IN

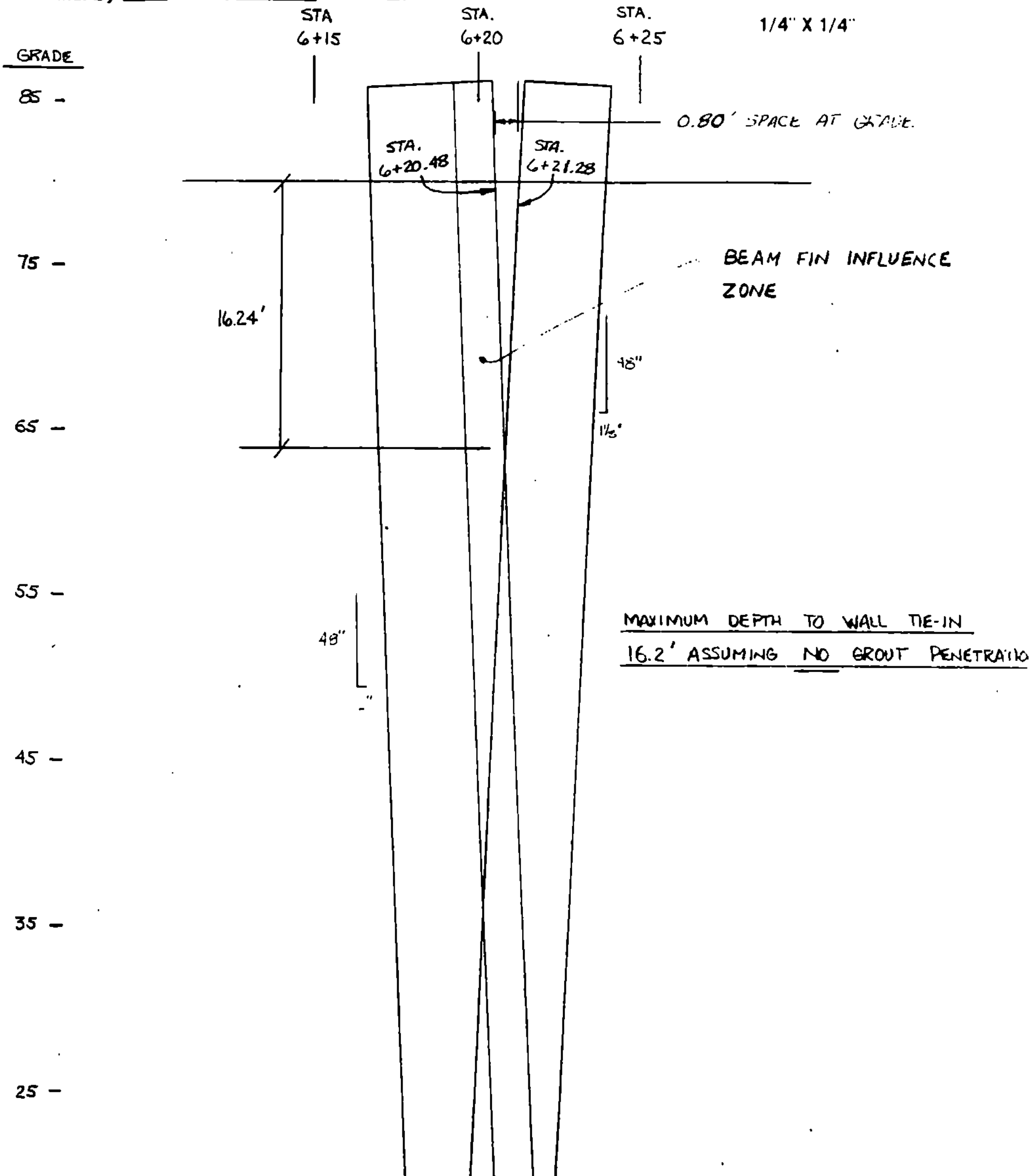
11.29' ASSUMING NO GROUT PENETRATION

CanonieEngineers

By MJS Date 6-24-86 Subject UTILITY CROSSING STA ~ 6+20 Sheet No. 1 of 1

Chkd. By ____ Date ________ INSTALLED 5-14-86 Proj. No. 85096P

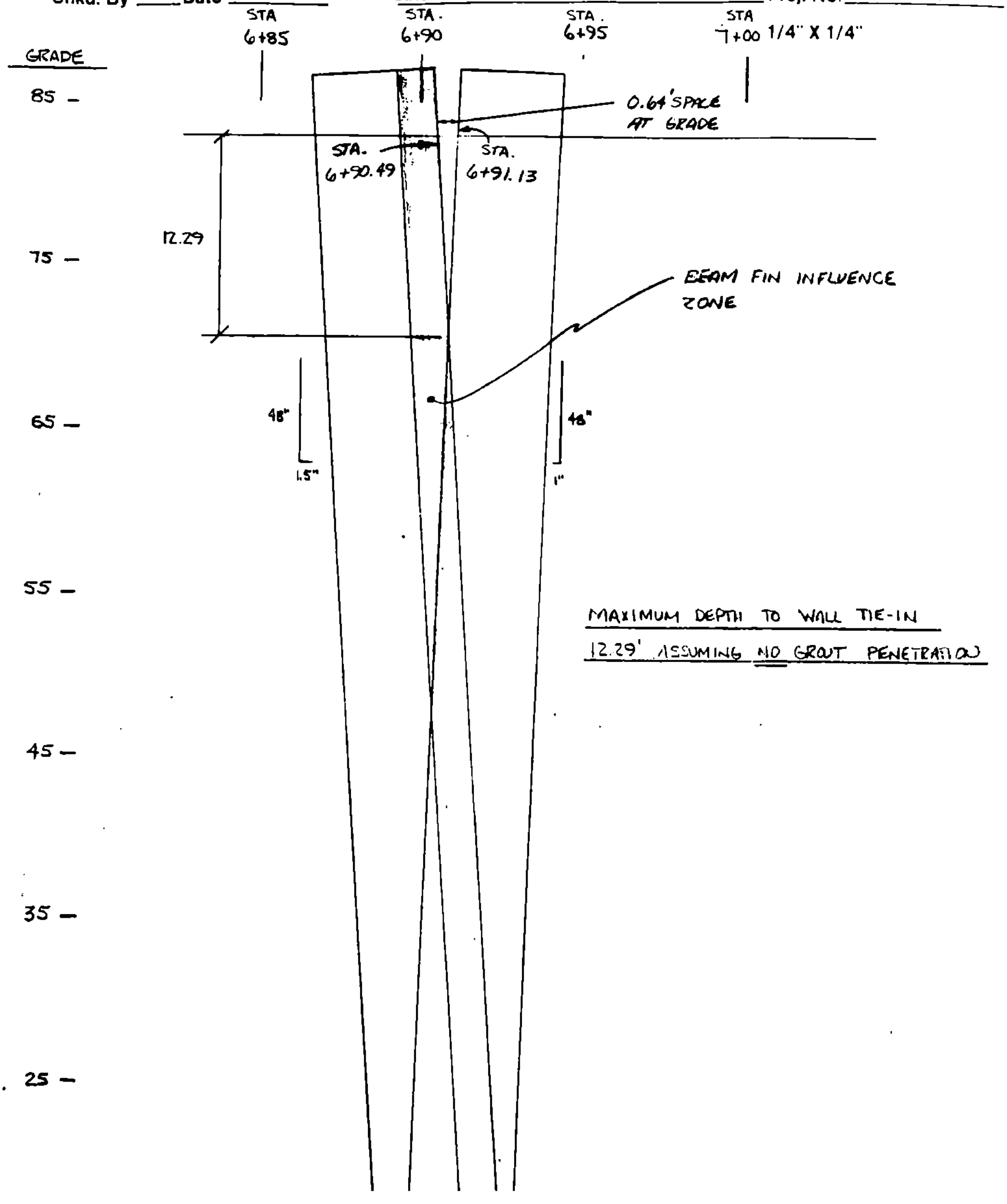
1/4" X 1/4"



CanonieEngineers

By MJS Date 6-24-86 Subject UTILITY CROSSING STA. ~ 6+92 Sheet No. 1 of 1

Chkd. By ____ Date ______ INSTALLED 3-28-86 & 5-31-86 Proj. No. 85096 P



Appendix H

LOG of BORING No. 2+00

DATE 4-11-86 SURFACE ELEVATION 77.50 LOCATION Station 2+00

DEPTH, ft.	SAMPLES	SAMPLING RESISTANCE	DESCRIPTION	ELEVATION	WATER CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	OTHER TESTS
55				22.0				
			Medium brown fine SAND, some silt, trace clay, trace mica flakes	21.7				
56			Medium brown SILT, little clay, trace fine sand, trace mica flakes	21.2				
57			Medium brown fine SAND, little silt, trace mica flakes	20.0				
58			Medium brown SILT, little clay, trace fine gravel, trace fine sand, trace mica flakes	19.4				
59			Medium brown fine SAND, some silt,trace coarse sand, trace clay, trace mica flakes	18.0				
60			Light brown medium to fine SAND, little silt, trace mica flakes	16.9				
61			Medium brown CLAY, some silt, trace mica flakes	16.3				
			Medium brown fine SAND, little silt, trace mica flakes	16.0				
62			Light brown SILT, little clay, trace coarse to fine sand, trace fine gravel, trace mica flakes	14.5				
63			Medium brown medium to fine SAND, little silt, trace clay, trace mica flakes	14.0				
64			End of boring					

Completion Depth 55.5 Feet Water Depth -- Feet Date 8-20-86

Project Name Mitchel Field Remediation - Phase 1A Project Number 85C2598-A

WCC-HP1

LOG of BORING No. 4+25

DATE 4-11-86 SURFACE ELEVATION 80.26 LOCATION Station 4+25

DEPTH, ft.	SAMPLES	SAMPLING RESISTANCE	DESCRIPTION	ELEVATION	WATER CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	OTHER TESTS
58				22.0				
			Light brown medium to fine SAND, little silt, trace mica flakes	21.4				
59			Medium brown SILT, little clay, trace fine sand, trace mica flakes	20.4				
60			Light brown fine SAND, little silt, trace mica flakes	19.4				
61			Light brown SILT, little clay, trace coarse to fine sand, trace mica flakes					
62				18.0				
			Medium brown coarse to fine SAND, some coarse to fine gravel, trace silt, trace mica flakes	17.3				
63			Light brown SILT, little clay, little fine gravel, trace coarse to fine sand, trace mica flakes	16.5				
64			Light brown coarse to fine SAND, little fine gravel, trace silt, trace mica flakes	16.0				
			Light brown CLAY, little silt, trace fine sand, trace mica flakes					
65				14.8				
66			Light brown coarse to fine SAND, little silt trace fine gravel, trace mica flakes					
			End of boring					

Completion Depth 66.3 Feet Water Depth -- Feet Date 8-20-86

Project Name Mitchel Field Remediation - Phase 1A Project Number 85C2598-A

WCC - RP 1

LOG of BORING No. 6+00

DATE 4-10-86 SURFACE ELEVATION 82.22 LOCATION Station 6+00

DEPTH, ft.	SAMPLES	SAMPLING RESISTANCE	DESCRIPTION	ELEVATION	WATER CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	OTHER TESTS
60				22.0				
			Light brown coarse to fine SAND, trace fine gravel, trace silt	21.0				
61			Medium brown fine SAND and SILT, trace clay, trace mica flakes	19.3				
62								
63			Rust brown fine SAND, some silt, trace mica flakes	18.0				
64			Medium brown fine SAND and SILT, little clay, trace mica flakes	15.6				
65								
66								
			Medium brown fine SAND, some silt, trace clay, trace mica flakes	14.9				
67			Light brown SILT, little clay, trace fine sand, trace mica flakes	14.0				
68			End of boring					

Completion Depth 68.2 Feet Water Depth -- Feet Date 8-20-86

Project Name Mitchel Field Remediation - Phase 1A Project Number 85C2598-A

WCC-RP 1

LOG of BORING No. 7+25

DATE 4-9-86 SURFACE ELEVATION 82.75 LOCATION Station 7+25

DEPTH, ft.	SAMPLES	SAMPLING RESISTANCE	DESCRIPTION	ELEVATION	WATER CONTENT, %	LIQUID LIMIT, %	PLASTIC LIMIT, %	OTHER TESTS
61			Medium brown coarse to fine SAND, little coarse to fine gravel, trace silt	21.8				
			Medium brown SILT and CLAY, trace fine sand, trace mica flakes					
63			Medium brown fine SAND, some silt, trace mica flakes	19.8				
65								
67								
69								
71			End of boring	11.8				

Completion Depth 71.0 Feet Water Depth -- Feet Date 8-20-86

Project Name Mitchel Field Remediation - Phase 1A Project Number 85C2598-A

WCC-HP 1

Canonie

FIELD BORING LOG

PROJECT No. CH 85-096
BORING No. 7+75
PAGE 1 of 1

PROJECT NAME MITCHEL FIELD
BORING LOCATION CONTAINMENT AREA
SURFACE ELEV. 78.6
DRILLER HYDRO GROUP
DATE: START 3.19.86 FINISH 3.20.86

DEPTH	SAMPLE NO.	SAMPLE TYPE	INTERVAL FROM	INTERVAL TO	BLOW COUNT 0-6	BLOW COUNT 6-12	BLOW COUNT 12-18	RECOVERY IN INCHES	U.S.C.S. SOIL TYPE	CONTACT DEPTH	SOIL DESCRIPTION AND REMARKS	PIEZO.
57.6	1	SS	56.6	58.6				18			brown coarse to fine sand, trace of fine gravel, trace of mica flakes.	
58.6	2	SS	58.6	60.6								
59.6								18			light brown to dark brown coarse to fine sand, trace of fine gravel, trace of mica flakes.	
60.6	3	SS	60.6	62.6								
61.6								18			medium to dark brown medium to fine sand, trace of fine to medium gravel, trace of mica flakes	
62.6	4	SS	62.6	64.6								
63.6								18			medium to dark brown medium to fine sand, trace of fine to medium gravel, trace of mica flakes	
64.6												

Canonie

FIELD BORING LOG

PROJECT No. CH 85-096
BORING No. 8+75
PAGE 1 of 1

PROJECT NAME MITCHEL FIELD
BORING LOCATION CONTAINMENT AREA SURFACE ELEV. 78.34 FT
DRILLER HYDRO GROUP DATE: START 3.20.86 FINISH 3.20.86

DEPTH	SAMPLE NO.	TYPE	INTERVAL FROM	INTERVAL TO	BLOW COUNT PER FT 0-6	6-12	12-18	RECOVERY IN INCHES	U.S.C.S. SOIL TYPE	CONTACT DEPTH	SOIL DESCRIPTION AND REMARKS	PIEZO.
56.0	1	SS	56.0	58.0		70					brown coarse to fine sand, trace of fine to medium gravel, trace of mica flakes	
57.0						70		18				
58.0	2	SS	58.0	60.0		67		18			brown coarse to fine sand trace of fine to medium gravel, trace of mica flakes	
59.0						68						
60.0	3	SS	60.0	62.0		62					brown coarse to fine sand trace of fine to medium gravel, trace of mica flakes	
61.0						63		18		61.0	brown clayey medium to fine sand and silt, trace of mica flakes.	
										61.7	brown clayey silt trace of fine sand trace of mica flakes	
62.0	4	SS	62.0	64.0		65				62.0	yellow-brown coarse to fine sand, trace of fine to medium gravel, trace of mica flakes	
63.0						65		18				
64.0												

Canonie

FIELD BORING LOG

PROJECT No. CH 85-096
BORING No. 9+00
PAGE 1 of 1

PROJECT NAME MITCHEL FIELD
BORING LOCATION CONTAINMENT AREA SURFACE ELEV. 77.90
DRILLER HYDRO GROUP DATE: START 3.19.86 FINISH 3.19.86

DEPTH	SAMPLE NO.	SAMPLE TYPE	INTERVAL FROM	INTERVAL TO	BLOW COUNT 0-6	BLOW COUNT 6-12	BLOW COUNT 12-18	RECOVERY IN INCHES	U.S.C.S. SOIL TYPE	CONTACT DEPTH	SOIL DESCRIPTION AND REMARKS	PIEZO.
	1	SS	56	58								
								18		56.9	dark brown, medium to coarse clayey sand trace of medium gravel, trace mica flakes	
57										57.5	brown, fine to medium sand, none to trace of silt, trace mica flakes	
											brown, fine to medium sand, none to trace of silt, trace of medium gravel trace mica flakes	
58	2	SS	58	60						58.5		
								18		58.7	dark brown to gray, medium to coarse clayey sand, trace fine to medium gravel, trace mica flakes	
59										59.1	brown, fine to medium silty sand, trace of medium gravel, trace mica flakes	
											brown, clayey silt, none to trace fine sand, trace of mica flakes	
60	3	SS	60	62						60.5		
61								18		61.4	brown to dark brown, fine to medium silty sand, trace of fine to medium gravel, trace of silty, clayey organics	
											brown silt with fine to medium sand trace of fine to coarse gravel, trace of mica flakes.	
62	4	SS	62		64					62.5		
63								18			light brown medium to fine sand, trace of fine to medium gravel, trace of clayey organic silt.	
64												

Canonie

FIELD BORING LOG

PROJECT No. CH 85-096
BORING No. 9+25
PAGE 1 of 1

PROJECT NAME MITCHEL FIELD
BORING LOCATION CONTAINMENT AREA SURFACE ELEV. 77.91
DRILLER HYDRO GROUP DATE: START 3.18.86 FINISH 3.19.86

DEPTH	SAMPLE NO.	SAMPLE TYPE	INTERVAL FROM	INTERVAL TO	BLOW COUNT 0-6	BLOW COUNT 6-12	BLOW COUNT 12-18	RECOVERY IN INCHES	U.S.C.S. SOIL TYPE	CONTACT DEPTH	SOIL DESCRIPTION AND REMARKS	PIEZO
	1	SS	56	58								
											brown to black coarse to fine sand and organic silt, some gravel and clay, trace of mica flakes	
57								18		57.1		
											light to medium brown fine to medium sand with silt, trace of fine gravel, trace of mica flakes	
58	2	SS	58	60								
										58.5		
											light brown to dark grey clayey silt with some fine sand, trace of gravel, trace of mica flakes	
59								18		59.3		
											dark brown coarse to fine sand trace of fine to medium gravel, trace of mica flakes	
60	3	SS	60	62								
										60.5		
61								18			light brown medium to fine sand, trace of silt and mica flakes	
62	4	SS	62	64								
										62.5		
63								18			as above	
64										64.0		

Canonie

FIELD BORING LOG

PROJECT No. CH 85-096
BORING No. 10+00
PAGE 1 of 1

PROJECT NAME MITCHEL FIELD
BORING LOCATION CONTAINMENT AREA
SURFACE ELEV. 77.48 FT
DRILLER HYDRO GROUP
DATE: START 3.21.86 FINISH 3.21.86

DEPTH	SAMPLE NO.	SAMPLE TYPE	INTERVAL FROM	INTERVAL TO	BLOW COUNT 0-6	BLOW COUNT 6-12	BLOW COUNT 12-18	RECOVERY IN INCHES	U.S.C.S. SOIL TYPE	CONTACT DEPTH	SOIL DESCRIPTION AND REMARKS	PIEZO
55.5	1	SS	55.5	57.5						55.5	light brown coarse to fine sand, some fine to medium gravel	
56.5										56.7	light brown fine to medium sand, trace of mica flakes and silt	
										57.0	light brown clayey silt with some fine sand, trace of mica flakes	
57.5	2	SS	57.5	59.5						57.5		
58.5												
59.5	3	SS	59.5	61.5							light brown medium to fine sand, trace of silt, trace of mica flakes, trace of fine gravel	
60.5												
61.5	4	SS	61.5	63.5								
62.5												
										63.1	light brown little clayey silt, trace of fine sand, trace of mica flakes	
63.5										63.5		