Predesign Study Report
Town of Otselic
Chenango County, New York

Gladding Cordage Site
Site No. 7-09-009

Work Assignment Number:
D002520-25.0

Prepared for

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

Prepared by

Dunn Engineering Company

12 Metro Park Road
Albany, New York 12205

DRAFT

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September 29, 1994

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1.0 INTRODUCTION

1.1 Purpose

Dunn Engineering Company (DUNN) has prepared this report to summarize the activities performed during the predesign investigation at the Gladding Cordage Site, Chenango County, New York (the "Site") (Figure 1). The predesign study has been conducted for the New York State Department of Conservation (NYSDEC) under New York State Superfund Standby Contract Work Assignment No. D002520-25.0. This predesign report identifies and describes the tasks and subtasks as they were performed with respect to the previously submitted June, 1994, Work Plan. The predesign report summarizes methods and results, and presents interpretations and recommendations for remedial design based on DUNN's interpretation of the field and laboratory data.

Background information for the predesign study was provided in the *Preliminary Draft Remedial Investigation Report* (1989) by GHR Engineering Associates, Inc., (RI) and the 1992 *Focused Feasibility Study* by the NYSDEC (FS).

1.2 Project Objectives

DUNN conducted the predesign study to obtain technical data for the design of a groundwater recovery and treatment system. The proposed remedial action goal is to control and recover groundwater with TCA concentrations above 100 µg/l (Figure 2).

The study included topographic and geophysical surveying, pilot boring installation, observation well installation, recovery well installation, aquifer pumping tests, and aquifer analysis. Recommendations for final design parameters, including pumping rates, water quality, and air emissions, are based on interpretation of technical data collected during this and previous studies.

1.3 Health and Safety

Health and safety precautions and protective measures were carried out in accordance with the approved Health and Safety Plan prepared by DUNN in March, 1994. There were no reported health and safety related incidents arising from the field activities associated with the predesign study.

2.0 TOPOGRAPHIC BASE MAP SURVEY

2.1 Introduction and Scope

A topographic survey was conducted by DUNN from July 11,1994, through July 15, 1994. The scope of work included a property line survey and detailed topographic mapping of selected portions of the Site that will be impacted during construction. Items that were surveyed include existing structures, foundation slabs, fences, curbs, above ground utilities, manholes, sewer inverts, outfall structures, berms, culverts, ditches and other drainage features. Pilot boreholes, monitoring wells, river staff gauges, and the location of geophysical anomalies were also surveyed. In addition, three elevation traverses were made across the Otselic River in the proposed area for the treatment building.

2.2 Methods

Surveying was performed by a licensed surveyor using an electronic distance meter (EDM) for the majority of measurements. An automatic level instrument was utilized to survey all new monitoring well measuring point elevations and for establishing topographic elevations along the survey baseline (refer to Plate 1).

Horizontal and vertical control was re-established at the Site by setting new benchmarks which were located on the existing topographic base map. Elevations were matched and registered using the surveyed measuring point at monitoring well TW-4D. In addition, topographic elevation points were spot checked in the field by comparison with data points depicted on the former base map. Previous topographic survey data from 1988 included a ground survey and areal photogrammetry. The recent (1994) survey by DUNN was tied into the GHR datum which referenced the National Geodetic Vertical Datum (NGVD). Due to differences in surveying methods and instrumentation, or actual casing movement relative to ground surface, slight discrepancies were noted in the monitoring well measuring point elevations between past and present surveying campaigns (Table 1). For internal consistency, the recent (1994) survey data were used to calculate the August 29, 1994, groundwater elevations.

Three river staff gauges were installed on July 12,1994 and surveyed. Staff gauges SG-1 and SG-3 consisted of approximately 8 foot long, 1/2 inch and 3/8 inch I.D. steel pipes driven roughly 3 feet into the Otselic River stream bed. Both gauges became unusable within a short time. Staff Gauge SG-3 was apparently vandalized soon after it was installed and surveyed. Staff Gauge SG-1 became unreliable on August 18, 1994 when the area received 2 to 3 inches of rain within a period of approximately 12 hours. The river rose (in excess of 5 feet) to an elevation above the top of the staff gauge. As a result the vertically positioned pipe became bent or angled. Staff gauge SG-2 remains reliable and consists of a painted galvanized steel nut located on the guard rail (upstream-side) of the County Route 13 bridge.

The survey results are presented on the base map (Plate 1). Monitoring well measuring point elevations for recently installed wells and the resurveyed monitoring wells installed pre-1994 are presented in Table 1.

3.0 GROUNDWATER FLOW MODEL

3.1 Preliminary Model

3.1.1 Purpose

A preliminary numerical groundwater flow model which was developed prior to well installation was used to evaluate alternative pumping scenarios and groundwater constituents travel times. The model also assisted in designing the aquifer pumping test conducted at the site. A copy of the modeling report has been previously submitted to NYSDEC.

3.1.2 Methods

The computer software, MODFLOW, a three dimensional groundwater modeling program developed in 1984 by McDonald and Harbaugh was used to analyze groundwater flow conditions. The MODFLOW model uses a block centered grid with the flow equation solution based on the finite difference method. A finite difference grid of 130 rows and 80 columns with an equal grid spacing of 20 feet (2600 feet x 1600 feet) was selected for the groundwater flow simulation. To account for monitoring well and recovery well partial penetration conditions, the aquifer was simulated using three layers to correspond with the shallow, intermediate and deep sections of the aquifer (layers 1, 2 and 3, respectively).

3.1.3 Input Parameters

Input parameters and constant head boundary conditions were estimated from data reported in the RI. A series of shallow, intermediate, and deep well clusters were installed during the RI field investigation. Well boring logs, insitu hydraulic conductivity tests, and water level measurements allowed for hydrogeologic characterization of the unconsolidated aquifer materials. The interpreted groundwater plume containing TCA concentrations greater than 100 µg/l was delineated using 1988 groundwater chemistry data from the RI report and analytical data reported by the NYSDEC for the period 1989 through 1993.

3.1.4 Results

Pumping test simulation, capture zone analysis, and travel time estimations were made using the model and the particle tracking program MODPATH (Pollock, 1990). Results and recommendations based on the model analysis are presented in the report "Numerical Groundwater Flow Modeling - Gladding Cordage Company" prepared for the NYSDEC by Rust Environment and Infrastructure in April, 1994. A copy of this report is provided as Appendix A.

4.0 GEOPHYSICAL SURVEY

4.1 Purpose

DUNN retained a subcontractor, Spectrum Northeast, to conduct a geophysical survey on the portion of the site that will involve construction activities. This work was conducted at the start of field activities, before the monitoring and recovery wells were installed. DUNN proposed, and NYSDEC concurred, that the long term historical use of the site as an active industrial facility and the incomplete documentation of possible underground structures warranted a subsurface geophysical survey as part of the predesign study. Specific objectives of the geophysical survey were to locate underground obstructions, utility lines or voids that could affect work safety, the location of remediation-related structures, excavation cost, or foundation stability. The information thus gathered was used to finalize well locations, modify site layout and indicate on the base map some of the areas where the contractor may encounter buried objects. A copy of the subcontractor's report is included in Appendix B.

4.2 Methods

The subcontractor selected for this task specializes in underground utility location. The subcontractor used a variety of instruments for achieving task objectives, including a GSSI System-3 ground penetrating radar unit with 300 MHZ transducer and a number of electromagnetic utility-locating instruments.

The survey crew conducted a series of bi-directional traverses in areas of interest including all proposed drilling locations, several proposed alternative discharge line trench alignments, and the exposed earth and concrete pad in the vicinity of the proposed treatment building. Detected anomalies may indicate the possible presence of underground structures. These anomalies were marked in the field and surveyed by DUNN's mapping crew. The locations of all anomalies discussed below are shown on Plate 1.

4.3 Results

The geophysical survey successfully accomplished task objectives. The proposed location of recovery well RW-2 was shifted slightly to avoid a possible buried utility line beneath the access driveway. Similarly, proposed new monitoring wells at the TW-14 cluster were shifted to avoid local anomalies near the base of the former water tower, and proposed well TW-7D was shifted slightly to avoid a buried water line. As a result of these adjustments, all monitoring and recovery wells were drilled without encountering significant obstructions.

The possible buried utility line referred to above was detected along the full length of the access road and south and east of the two-story building on Gladding Street. Discussions with local residents familiar with the site revealed that this anomaly is most likely associated with a buried water line, reportedly now abandoned and inactive. Any future construction contractor should be alerted to this feature during excavations for wellhead structures at RW-1 and RW-2 and for the discharge line trench.

Electromagnetic anomalies were detected at the former dye leaching pit beneath the access roadway just east of RW-2. The anomalies indicate that metallic objects are present in the pit and pipes associated with this structure may be encountered during trench excavation.

Two rectangular shaped anomalies were detected at the south end of the access road just west of TW-4 cluster. These anomalies should not interfere with the proposed excavations. The electromagnetic signatures suggest that these anomalies are caused by shallow, tabular shaped metallic objects.

What appear to be several metallic conduits were detected on the large concrete pad in the vicinity of the east-west leg of the proposed discharge line trench. These possible conduits trend generally north-south and cross the proposed trench alignment.

Using a GPR unit, the survey crew detected a large void in the concrete slab adjacent to the initially proposed treatment building site. Subsequent investigation of appurtenant structures on the concrete surface revealed the existence of a suspected north-south trending sluiceway beneath the slab. This feature resulted in shifting the proposed treatment building to its present location shown on the design drawings.

5.0 MONITORING AND RECOVERY WELL INSTALLATION

5.1 Monitoring Wells

5.1.1 Purpose

The predesign study included the installation of one shallow, two intermediate and two deep monitoring wells. The wells were installed to supplement the existing monitoring well network, primarily in the area designated for the recovery wells. The predesign study Work Plan originally specified the installation of five wells. Well TW-7D was added, at the request of, NYSDEC, to investigate potential downward migration of TCA into the deep portion of the unconsolidated aquifer.

5.1.2 Design

The wells were designed for compatibility with pre-existing onsite wells. Typically, this included 2-inch I.D. Type 304 stainless steel screen (0.010" slot) and riser materials, a #0 Morie silica sandpack, a bentonite slurry seal and a cement/bentonite seal completed to original surface grade. Each well was finished with a lockable, 4-inch steel protective casing. Details of the original well design specifications are included in the predesign study Work Plan.

5.1.3 Installation

All wells were installed in accordance to the procedures outlined in the predesign study Work Plan with the exception of minor variations in screened intervals at locations TW-7D and TW-15I, and the elimination of a sand choke above the well screen sandpack at all locations. The sand choke was eliminated since it was agreed that the potential for bridging of the fine sand material could hinder or prevent placement of an effective bentonite seal. American Auger and Ditching, Inc.(American Auger) provided drilling and well installation services throughout all phases of the project. Table 2 summarizes construction details for the the recently installed (1994) monitoring wells. Individual well completion diagrams are also provided as Appendix C.

5.1.4 Development

Following installation, each monitoring well was developed to remove fine grained sediment and to increase the hydraulic connection between the well and the aquifer. Field parameters, including color, pH, temperature, specific conductivity and turbidity were monitored throughout the development process. Purging was accomplished using a Waterra inertial pump and polyethylene tubing and/or well-dedicated PVC bailers. Well development continued until at least 10 well volumes were removed and field parameters appeared to stabilize. However, a turbidity goal of less than 50 Nephelometric Turbidity Units (NTUs) could not be obtained on a consistent basis. Well development field records are included in Appendix D.

5.2 Recovery Wells

5.2.1 Purpose

Two recovery wells, RW-1 and RW-2 were installed for the primary purpose of controlling the groundwater within the contaminant plume; specifically in the area where TCA concentrations are greater than 100 µg/l (Figure 2). The recovery wells were also used during three pumping tests to determine distance/drawdown relationships at various pumping rates and to provide data for recovery system design.

5.2.2 Design

Recovery well locations, approximate depths and an estimate of flow velocities were based on the groundwater flow modeling results. DUNN presented a preliminary design for both wells in the predesign study Work Plan. Modifications to the original design were based on the geologic conditions encountered. This included significant variations in the originally proposed screened interval at each well location and a reduction in total depth for RW-1.

Recovery well design was based on interpretation of laboratory gradation analyses of split spoon samples collected during the recovery well pilot borings. Filter gravel pack materials were determined from the grain size distribution curves. Specifically, the gravel pack design was based on the finest sample within the screened interval to minimize well water turbidity. Slot sizes were selected based on the gravel pack. Screen diameter, length and design were chosen so that the average entrance velocity of the water entering the screen at maximum design yield is less than 0.1 feet per second. The screen slot size was selected to retain approximately 90 percent of the gravel pack. Groundwater approach velocity at design yield was also used as a design criterion.

$$V_A < \sqrt{k/30}$$

where: V_A = approach velocity
k = hydraulic conductivity

An aquifer hydraulic conductivity of 170 feet/day (0.06 cm/sec), based on the RI, was used for this calculation. Table 3 summarizes design and construction details for recovery wells RW-1 and RW-2. Well completion diagrams are included in Appendix C and well design calculations are included as Appendix E.

5.2.3 Installation

Pilot borings for laboratory grain size analyses were drilled during the period June 23,1994 to June 28,1994. Continuous split spoon samples were collected from the interval 40 feet to 84 feet at RW-1 and from the interval 46 feet to 80 feet at RW-2. Boring logs are provided as Appendix F. Laboratory reports for gradation analyses are included as Appendix G.

Recovery well drilling and installation took place from August 8, 1994 through August 18, 1994.

At each well location a 14-3/4 inch boring was advanced using a tricone bit and Revert, a natural guar gum polymer drilling additive. A 12 inch I.D. outer steel casing was installed to the total depth of the borehole. The casing was cleaned out prior to placement of the stainless steel screen (equipped with appropriately spaced centralizers) and the riser pipe. An appropriately sized gravel pack was installed in the inside annulus of the 12 inch casing. As the gravel pack was placed, the steel casing was withdrawn incrementally from the well allowing the sandpack to fill the void area surrounding the well screen.

This process continued until the sand pack extended upward to within approximately 6 feet of the ground surface. A bentonite seal was placed above the gravel pack to prevent downward flow of surface water through the gravel pack. The remainder of the annulus was left open to allow for working access to reduce riser pipe stickup (currently approximately 1 to 1.5 ft above grade).

5.2.4 Development

Well development began on August 13, 1994, immediately following installation of well RW-1 and continued on an intermittent basis until August 23,1994. RW-2 development began August 18,1994 and was also completed on August 23,1994. Three development methods were employed; air jetting, mechanical surging, and suction pumping. Initial development at both locations was accomplished by lowering the drill rods with an attached jetting tool into the well. The drilling rig air compressor was utilized as an air pulsating mechanism to displace water. Wells RW-1 and RW-2 were developed by air jetting for approximately 7 hours and 3 hours, respectively.

Mechanical surging was performed by placing a surge block into the well with the drill rig wireline and with a spudding action, gradually lowering the surge block into the well screen. After surging for several minutes, the surge block was removed, again through use of a spudding motion.

Surge block development was immediately followed by pumping with a suction (trash) pump to remove any sediment that was released from the formation into the well screen. Water withdrawal using either of the available trash pumps onsite (5 h.p. and 8 h.p.) allowed for specific capacity measurements to be made throughout well development. Surging and pumping maximized flow rates and reduced turbidity. This process proceeded until specific capacity stabilized or no longer appeared to benefit from continued development.

5.3 Decontamination

American Auger performed decontamination procedures on all equipment used during boring and well installation using steam cleaning procedures outlined in the predesign study Work Plan.

5.4 Soil and Groundwater Management

Other than split spoon samples, soil cuttings were not generated during pilot boring and monitoring well drilling. Soil cuttings generated during drilling of the 14-3/4 inch diameter recovery well were spread out and temporarily staged on polyethylene sheeting to dry and to facilitate Revert breakdown. Several weeks later, prior to demobilization, American Auger stockpiled the drill cuttings in a pre-designated area north of Gladding Braided Product's loading docks.

Purge water generated during monitoring well development was discharged to the ground. Recovery well development water was pumped into a concrete vault located adjacent to well TW-15I. The vault apparently discharges to the ground.

6.0 RECOVERY WELL AND AQUIFER TESTING

6.1 100-Minute Step Rate Tests

6.1.1 Purpose

Step rate aquifer pumping tests were conducted on each of the newly installed recovery wells to study well efficiency, performance, and aquifer response.

6.1.2 Methods

American Auger installed Grundfos submersible well pumps in each recovery well after development. The pump intake was positioned at a depth of approximately 46 feet below grade in well RW-1 and at a depth of approximately 64 feet in well RW-2. Pumps were suspended with steel cable while 1 1/2 inch I.D. Schedule 80 PVC pipe was installed to transfer pump discharge to the surface. Niagara flow meters and 1 1/2 inch gate valves were installed inline at the wellhead to measure and regulate flow velocities. In addition, sampling ports (taps) were fitted to allow for groundwater sampling at each recovery well. Sampling was performed using procedures outlined in DUNN's June, 1994 Analytical Quality Assurance Plan (AQAP).

Step rate testing was conducted on August 25 and August 26,1994 for wells RW-1 and RW-2, respectively. Each test consisted of three progressive pumping steps; 30 gpm, 60 gpm and 100 gpm. Recovery well RW-2 was unable to maintain a constant yield of 100 gpm and as a result, the flow was cut back to 80 gpm approximately 15 to 20 minutes into the test.

Pressure transducers were configured in a manner similar to that stated in the predesign work plan. Since pressure transducers were already set up, it was decided in the field that with minimal additional effort, DUNN and the NYSDEC could readily collect even more data than were originally proposed. This included pressure transducer drawdown data at RW-2, TW-5S, TW-5I and TW-5D during RW-1 step rate testing, and at RW-2, TW-3I, TW-4S, TW-4I, and TW-4D during RW-2 step rate testing.

DUNN collected pre-test water level data for approximately 40 hours prior to step rate testing to assist in development of antecedent water level trends and aquifer barometric efficiency relationships.

From the step drawdown tests results, specific capacity calculations were performed to help determine pumping rate design specifications.

6.1.3 Results

After pumping for a period of 100 minutes at a rate of 30 gpm, greater than 0.10 feet of drawdown was observed at radial distances up to 200 feet from well RW-1 and up to 208 feet from well RW-2. When the pumping rates were increased, drawdown in individual observation wells was observed to increase proportionally with increases in flow rate.

Distance drawdown plots (Appendix H) for individual step rate tests at 30 gpm suggest that the cone of depression extends in the range of 300 to 600 feet beyond the pumping well. Interpretation of both plots indicates that approximately 0.1 feet of drawdown occurs at distances of roughly 200 feet. Thus, estimated drawdown based on the distance - drawdown relationship is in agreement with the measured drawdown observed in the field following 100 minutes of pumping.

Table 4 presents maximum recorded drawdown, at each flow rate, for the observation wells that were used during step rate testing. Figure 3 delineates projected drawdown after a period of 100 minutes with both wells pumping at 30 gpm (each).

Based on the 100-minute step rate test data, specific capacity ranges from 15.2 gpm/ft at 100 gpm to 19.4 gpm/ft at 30 gpm for recovery well RW-1 and from 1.50 gpm/ft at 80 gpm to 17.7 gpm/ft at 30 gpm for well RW-2. Intermediate values at 60 gpm are 17.4 gpm/ft and 6.6 gpm/ft for wells RW-1 and RW-2, respectively.

6.1.4 Recommendations

Well RW-1 should not be pumped at a discharge rate that exceeds 80 gpm as significant quantities of very fine sand and silt material have been observed to enter the well screen at these higher flow rates.

Well RW-2 should not be pumped at rates exceeding 30 gpm due to the significant observed loss in specific capacity at discharge rates exceeding 30 gpm.

6.1.5 Temporary Groundwater Treatment System

All water generated during the aquifer pumping tests was treated for TCA using a granular activated carbon (GAC) adsorption system rented from Calgon Carbon Corporation. The system was configured in a manner similar to that illustrated in the treatment system flow diagram included with the predesign study Work Plan. The only significant variation was the addition of a FSI bag filter system placed between the transfer pump and the GAC inlet manifold.

6.2 24-Hour Constant Rate Test

6.2.1 Purpose

A 24-hour constant rate test was performed to study aquifer characteristics by observing drawdowns at various locations throughout the site and collecting groundwater quality samples for air stripper design. With this information, the optimum pumping rate and sizing of the groundwater treatment system was estimated.

6.2.2 Methods

The 24-hour constant rate test was conducted beginning at 1:30 PM on August 29,1994. Recovery wells RW-1 and RW-2 were both pumped at a rate of 50 gpm for a 24 hour period.

American Auger, the NYSDEC, and DUNN monitored flow rates regularly throughout the pumping test. Adjustments were made when needed by regulating the gate valve at each wellhead.

Flow rates remained very constant throughout the test and required very little adjustment, except for several brief periods of generator failure.

DUNN and the NYSDEC measured drawdowns manually and electronically as set forth in the Work Plan, with several minor exceptions. The NYSDEC collected transducer data at TW-3I in addition to the other proposed wells, and DUNN collected data manually at SG-2 instead of placing a pressure transducer in the Otselic River. Additionally, a stilling tube designated RG-1, was installed in the river by DUNN to monitor river stage on an hourly basis during the test. RG-1 was located approximately 30 feet upstream from the outfall for the treated water.

DUNN analyzed water level and barometric pressure data collected over a period of approximately 2.5 days prior to the constant rate pumping test to evaluate background trends. Wells RW-2, the TW-5 well cluster and well TW-15I were monitored during this period. Corrections to the drawdown data were made based on the pre-test antecedent trend.

Corrected time-drawdown data were plotted for each well (Appendix I). Time-drawdown data for selected observation wells were analyzed using Streltsova's (1974) method to estimate aquifer transmissivity and specific yield. Streltsova's method was considered appropriate because it accounts for partial penetration of monitoring and recovery wells in water table aquifers as well as for delayed yield effects typical of unconfined, unconsolidated aquifers. Corrections for well interference were made by subtracting adjusted, single well pumping data collected during step rate testing (drawdown at 30 gpm x 1.667) from the 24 hour constant rate test. This method was employed to analyze drawdown data from wells TW-4I and TW-14I.

Well TW-15I is located roughly equidistant from the pumping wells. Analysis performed on observation well TW-15I used measured drawdown data that was not corrected for well interference. Instead, a combined pumping rate of 100 gpm was assumed for the aquifer analysis.

6.2.3 Results

At each well, an average pumping rate of 49.5 gpm was measured for the 24 hour pumping interval. During the approximate time interval 800 to 1050 minutes, pumping ceased for several seconds/minutes at both wells on several occasions because of temporary diesel generator malfunction. The transducer data collected at the TW-5 cluster and well TW-15I do not appear adversely affected by pump failure. However, a measurable reduction in drawdown (up to several hundredths of a foot) was recorded at the TW-4 cluster, TW-14 cluster and well TW-3I toward the end of the pumping test.

Maximum drawdown observed during the 24-hour pumping test is presented in Table 4 and Figures 4 and 5. The reported drawdowns were corrected for antecedent trend using a correction factor of 0.000067 feet/minute (0.09 feet/day). Analysis of water levels versus barometric pressure over a period of approximately 4 to 5 days indicated no apparent relationship between atmospheric pressure decreases and an increase in hydraulic pressure heads.

Within individual well clusters, observed drawdown was consistently greater within the intermediate and deep wells than in the shallow wells (Table 4). Maximum decreases in hydraulic head correspond to the screened sections of the recovery wells where detected concentrations of TCA have historically been highest. Thus, the pumping test data indicate a good hydraulic connection between the recovery wells and the TCA contaminated horizons of the aquifer.

Time-drawdown plots of all wells monitored by data logger show that steady state conditions were not achieved during the 24-hour test but abundant data were available for estimating aquifer transmissivity. The specific yield estimated using Streltsova's solution, is considered less reliable than the transmissivity values since steady state conditions were never achieved during the pumping test.

DUNN analyzed the data using Streltsova's curve matching method. "Type A" curves show the aquifer's initial response to pumping at which time the aquifer releases water from storage, behaving similar to a typical confined aquifer. At the site, this period usually occurred during the first 10 to 20 minutes of pumping as seen in the observation wells located within a radial distance of approximately 150 feet from both of the pumping wells. As the water table continued to decline, flow toward the pumping wells was derived primarily from gravity drainage of the aquifer. During this period, the time-drawdown relationship becomes a function of horizontal to vertical hydraulic conductivity, anisotropy, distance to pumping wells, and aquifer thickness. As time increased, drawdown was observed to gradually decrease. In theory, time-distance data again follow a Theis type curve as storativity equals the specific yield of the aquifer. This later stage of drawdown corresponds with Streltsova's "type B" family of curves. The transmissivities generated from "type B" curve matching are approximately two to three times higher than those calculated using the early drawdown data (Type A curves). Table 5 presents a summary of the aquifer analysis for the 24-hour constant rate pumping test. Streltsova analysis Part A and Part B curve matching graphs are included in Appendix J.

The results indicate that the hydraulic conductivity values used for the groundwater model are consistent with the results of the aquifer test analysis. The average hydraulic conductivity based on the Part A analysis, which is considered more reliable than the Part B analyses, is 25.9 ft/day (9.1x 10^{-3} cm/sec). The value used for the groundwater model was 14 ft/day ($5x10^{-3}$ cm/sec). The hydraulic conductivities derived from the pumping test data are in good agreement with the range of values previously reported in the RI report.

7.0 GROUNDWATER SAMPLING AND ANALYSES

7.1 Purpose

DUNN collected samples of groundwater during the pumping tests for the following purposes:

- to evaluate the temporal changes in TCA concentrations at different pumping rates,
- to help determine the optimum groundwater withdrawal rate,
- to confirm a suitable TCA concentration for air stripper design,
- to characterize well water for physical and chemical parameters that could be indicative of well fouling potential, and
- to verify the effectiveness of the temporary treatment system at removing TCA from the pump test discharge water.

7.2 Methods

DUNN collected water samples from both RW-1 and RW-2 following the procedures set forth in the Work Plan and AQAP. Samples were collected at the start of the 30 gpm step of the step-rate test and at the end of the 30 gpm, 60 gpm, 80 gpm (RW-2) and 100 gpm (RW-1) steps. A sample of treated water from the GAC effluent stream was collected early during the step rate test to ensure that discharge limitations for the temporary treatment system were being met. Water samples were also collected from RW-1 and RW-2 at the start and finish of the 24-hour constant rate test. Field measurements for temperature, pH, specific conductance, and turbidity were made at frequent intervals throughout the constant rate test to identify temporal variations in these parameters. All samples collected for laboratory analysis were analyzed individually except for one sample from RW-1 and RW-2 which was composited in the laboratory prior to analysis.

The individual samples were analyzed for VOCs according to SW-846 Method 8010. The composite sample was analyzed for TCL/TAL as per the NYSDEC Analytical Services Protocol, total dissolved solids per Method 160.1, total suspended solids per Method 160.2, and alkalinity per Method 310.1.

7.3 Results

The preliminary results are summarized in Table 6 which has been submitted previously to NYSDEC. The final validated results are not yet available and will be forwarded to NYSDEC under separate cover during the week of October 10.

TCA concentrations varied from 110 µg/l to 130 µg/l in RW-1 and from 88 µg/l to 130 µg/l in RW-2. The concentration of the composite sample was 160 µg/l. These concentrations are below the design concentration of 500 µg/l; therefore the air stripper effluent should produce an effluent with TCA concentrations well below discharge limits.

Variations in TCA concentrations within the individual wells do not appear to be significant over the range of pumping rates tested. The observed variations lie within the expected range of variations caused by natural and analytical processes. The significance of the slight increase in the concentration of TCA at extraction well RW-1 at pumping rates greater than 50 gpm and above, and RW-2's slightly higher concentrations at 30 gpm may be artificial. Variations in the field parameters measured during the constant rate test were very minor, indicative of the consistent quality of water pumped over a 24- hour period.

TCA was not detected in the GAC effluent indicating that the GAC unit performed as intended and the temporary discharge requirements were met. The low concentrations of the inorganic analytes measured to evaluate fouling potential are indicative of the low potential for fouling.

Table 7 presents a summary of TCA groundwater concentrations reported for past and recent (July, 1994) sampling events.

8.0 GROUNDWATER FLOW

8.1 Water Level Measurements

A complete round of water level measurements was collected on the morning of August 29, 1994 prior to the 24-hour constant rate test. Table 8 includes this information along with additional water level elevations recorded at the site since October 1987.

8.2 Flow Directions and Rates

Local groundwater flow is to the south-southeast (Figure 6). Average horizontal gradient is approximately 0.0043 ft/ft. Flow velocities across the site were estimated using the intermediate well groundwater elevations collected on August 29,1994 and an average hydraulic conductivity of 25.9 feet per day as determined from the constant rate pumping test. Horizontal flow velocities were calculated along the flow line from the southern "plume boundary" defined by the 100 µg/l TCA isoconcentration line south of TW-4 well cluster to well TW-12I, located adjacent to the closest downstream receptor, the fish hatchery well.

Velocities were calculated using a modified form of the Darcy flow equation:

$$V_n = KI_n/n$$

where V_n = linear horizontal groundwater velocity (ft/day);
K = hydraulic conductivity (ft/day);
I = horizontal component of hydraulic gradient;
n = effective porosity (0.25 assumed - from RI).

Based on this equation, horizontal flow velocity is calculated at 0.45 ft/day.

9.0 DESIGN PARAMETERS

DUNN has evaluated pumping rates, specific capacities, influent water quality, potential air emissions, and flood elevations for the Gladding Cordage recovery well system design. Based on the evaluation, recommended design parameters have been developed and are summarized below. Preliminary design parameters were developed and submitted to the NYSDEC on September 15, 1994.

9.1 Radius of Influence

The step-drawdown and constant rate pumping tests were conducted and evaluated to estimate the radius of influence at different pumping rates in a single well and at a combined pumping rate of 100 gpm from both wells. The rates evaluated were based on the range of anticipated pumping rates to be used during system operation. A system pumping rate of 100 gpm had been estimated in the Feasibility Study.

Pumping a recovery well lowers the water table in the vicinity of the well and creates a gradient towards the extraction well ("cone of influence"). The cone of influence will expand radially until the amount of recharge flowing into the cone equals the well discharge. Once this expansion ceases, the cone is considered to be at a steady state, a dynamic equilibrium condition under which some fluctuations may occur. Although the cone of depression may extend to long distances where the drawdown becomes infinitesimal, for practical and design purposes the radius of influence is defined here as the zone where drawdown exceeds a nominal 0.2 ft.

Groundwater levels and the radius of the capture zone will fluctuate with time in response to natural conditions such as seasonal variations in groundwater levels, precipitation, recharge rate, and river stage. It is recommended that pumping rates, monitoring well drawdowns, and well water quality be monitored periodically during operation to identify and characterize the magnitude of these variations. Pumping rates should be modified as necessary to optimize system performance, i.e. the wells should be pumped at the lowest rate necessary to capture the 100 µg/l plume, within hydraulic design constraints. The average plume extent is shown on Figure 2.

9.2 Pumping Rate

The test results indicated that after 24 hours a combined pumping rate of 100 gpm (50 gpm per well) developed a cone of depression, i.e. capture zone, that extended approximately 350 feet, well beyond the monitoring wells, e.g. TW-3, TW-6, TW-7 and TW-9, that are located slightly outside the targeted 100 µg/l (ppb) contour line (see Figure 4). Pumping for longer periods would slightly increase the radius of influence because steady state conditions were not completely attained at distant monitoring wells after completion of the 24 hour pump test. It was therefore concluded that a pumping rate of 100 gpm as proposed in the Feasibility Study would exceed the rate needed to achieve project objectives.

Based on these observed drawdowns and that drawdown is linearly proportional to pumping rate, it was determined that a total 60 gpm rate (60 percent of 100 gpm) would be sufficient to develop a 0.2 ft drawdown around the fringe of the 100 µg/l target zone (see Figure 2). It is therefore

anticipated that the pumping rates required per well to achieve remedial objectives will be between 30 gpm and 50 gpm, i.e. total discharge to the treatment system between 60 gpm and 100 gpm. Lower pumping rates may achieve objectives, but with a lower factor of safety than the 30 gpm rate. As the required capture zone shrinks with time, lower pumping rates may be appropriate. Higher pumping rates would also accomplish the objectives. However, the higher rates would increase cost, lower specific capacity and increase potential for turbidity or well damage.

The well pumping and treatment system should be designed to efficiently handle flows in the range of 30 to 50 gpm per well. To minimize costs it is recommended that the initial flow rate be set at 30 gpm per well or 60 gpm total flow to achieve the desired capture radius. The fine grained aquifer material encountered at RW-2 required that the well be designed with a fine grained filter pack and slot opening to minimize turbidity. This design limits well yield. As a result, it is recommended that RW-2 be pumped at rates no greater than 30 gpm. This constraint does not apply to RW-1 which may be pumped as high as 50 gpm. Higher rates at RW-1 however may increase the potential for entrained suspended solids. The recommended range of operational pumping rates is therefore 60 gpm to 80 gpm.

9.3 Specific Capacity and Recovery Well Water Levels

Specific capacity values for each well (pumping rate, in gpm, divided by drawdown, in feet) were estimated using data collected during the pumping tests. The specific capacity values can be used to estimate the magnitude of drawdown in a pumping well for a specific pumping rate. Specific capacity values may decrease with time and with increased pumping rate. Accordingly, the drawdown in the recovery wells has been conservatively estimated using the specific capacity values estimated from the 24 hour 50 gpm per well constant rate test. After 24 hours, the drawdown in RW-1 appeared to stabilize, and a fairly reliable value of specific capacity can be estimated. The drawdown in RW-2 apparently had not stabilized after 24 hours and therefore, it was necessary to extrapolate forward to estimate drawdown and specific capacity.

RW-1 13.0 gpm/ft

RW-2 2.7 gpm/ft

These specific capacities can be used to estimate water levels in the recovery wells during pumping. Regardless of specific capacity values, it is recommended that the pump intakes be installed as low as possible a few feet above the well screens to maximize the available drawdown. Specific capacity may change with time and pumping rate, and in response to additional well development as discussed in the preliminary design parameters report. Pumping levels may also be affected by variations in static (non-pumping) water levels.

For a pumping rate of 30 gpm and a specific capacity of 13.0 gpm/ft in RW-1, the drawdown would be approximately 2.3 feet. The drawdown in RW-2 for the same pumping rate and a specific capacity of 2.7 gpm/ft would be approximately 11.1 feet.

9.4 Water Quality

Based on the FS and ROD, the chemical of concern at the Gladding Cordage Site is 1,1,1-trichloroethane (TCA). The preliminary water quality results indicated that the TCA concentration varied between 99 µg/l (ppb) and 130 µg/l (ppb) during the step rate tests which lasted 100 minutes each. The TCA concentrations varied between 88 µg/l (ppb) and 160 µg/l during the 24-hour combined well pumping test. These results are below the preliminary (worst case) TCA concentration estimate of 500µg/l (ppb) to be used for design .

Water quality within the cone of depression may change with time as the TCA is removed. It is anticipated that TCA concentrations will decrease with time, but short term increases in TCA concentrations may occur. Based on the 500 µg/l concentration recommended by the NYSDEC for design, a conservative margin of safety is provided.

9.5 Water Pretreatment

The preliminary water quality data included analytical results for iron, manganese, calcium, hardness, alkalinity, total dissolved solids, total suspended sediments, pH, temperature, specific conductance, and turbidity. These analyses were conducted to evaluate the fouling potential or treatment system scaling. The samples were collected from the two recovery wells combined discharge at the end of the 24-hour pumping test. This discharge is assumed to be reasonably representative of future conditions and therefore suitable for design purposes.

An analytical results review indicates that pretreatment of well water to reduce the fouling compounds concentrations is not warranted. The treatment system design should therefore proceed under the assumption that water pretreatment is not required. Future sampling and analyses should be conducted appropriately during operations to verify that water quality and fouling potential have not significantly changed.

9.6 Air Emissions

The emission rate of TCA from the air stripper has been calculated and submitted to NYSDEC. The emission estimates were based on a well water flow rate of 100 gpm, TCA concentration of 500 µg/l (ppb) and stripper removal efficiency of 98.92 percent. The air stripper modeled was a two tray, low profile air stripper Model 3621. The predicted emission rate is 0.025 lbs/hr TCA - well below the emission rate requiring air pollution controls. Treatment system design is proceeding based on the assumption that vapor phase carbon treatment of air stripper emissions will not be required.

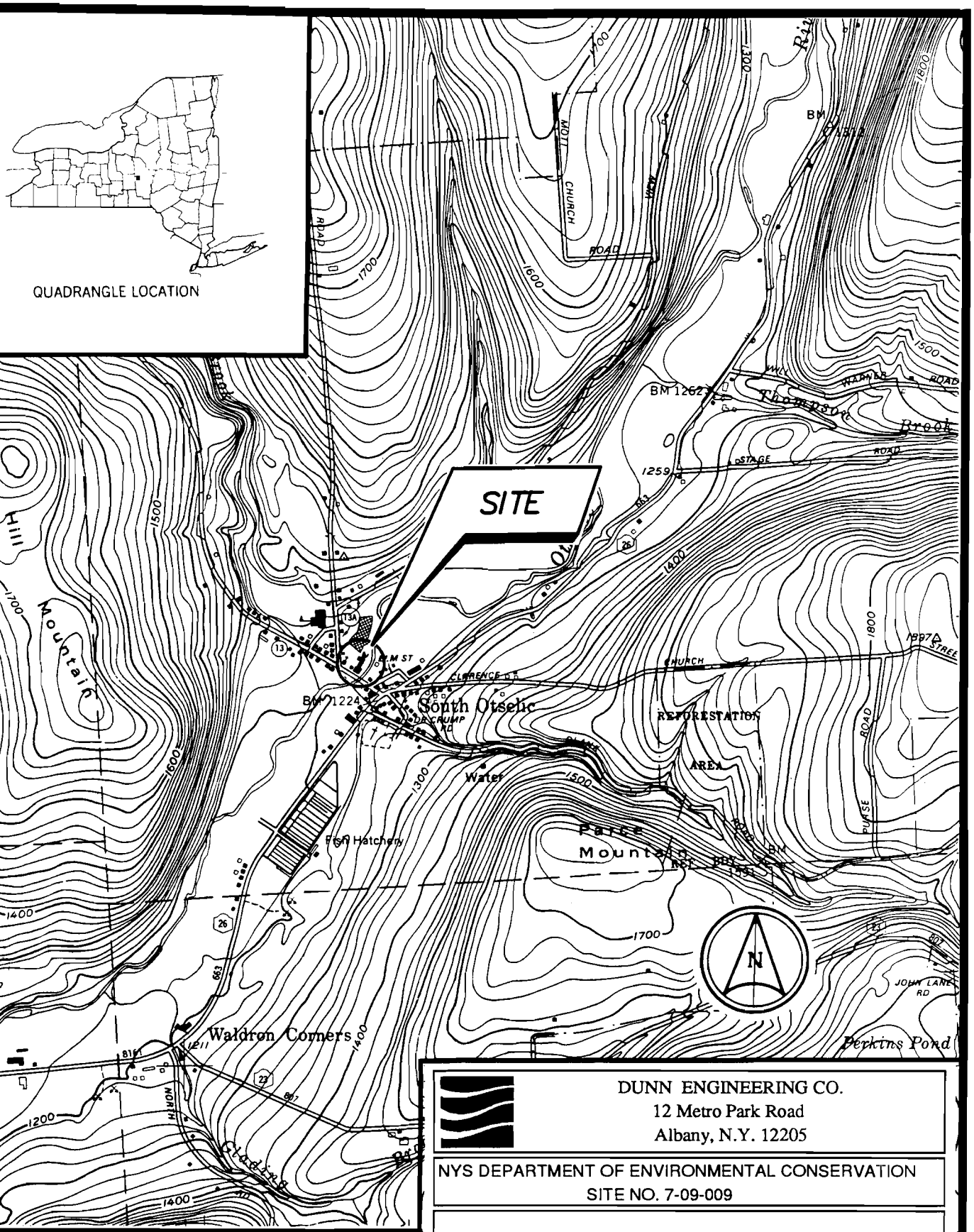
9.7 100-Year Flood Elevation

The FEMA flood insurance map that includes the Gladding Cordage Site delineates a floodway, but does not provide an elevation that can be used for design purposes. It is therefore suggested that a suitable elevation nominally above flood stage be considered for design of the treatment building floor elevation. An appropriate elevation may be the mid-roadway elevation on the Gladding Street bridge that crosses Otselic River adjacent to the site.

10.0 APPLICABLE SCGs

Applicable SCGs will be addressed in the TAMs report.

FIGURES



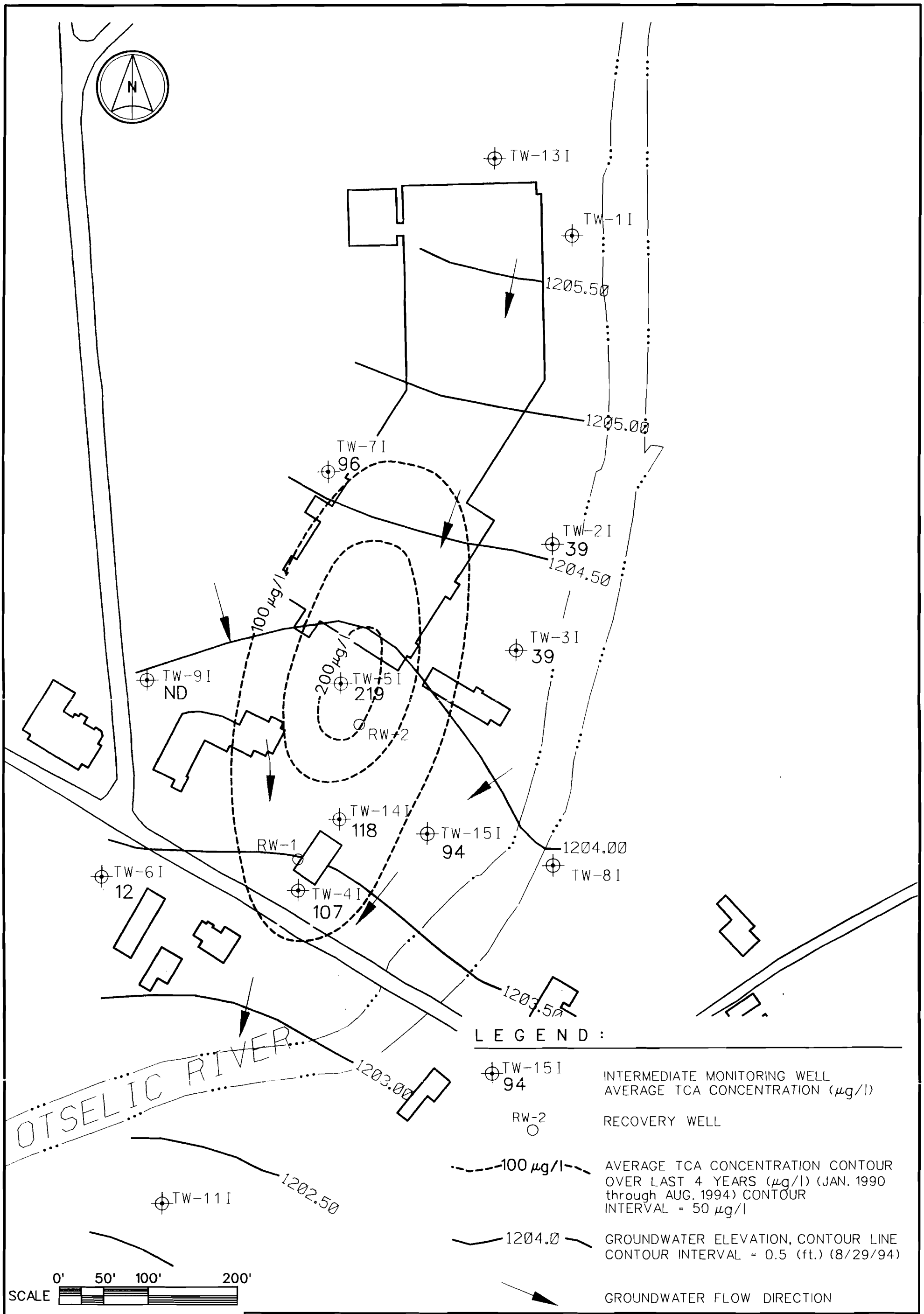
DUNN ENGINEERING CO.
12 Metro Park Road
Albany, N.Y. 12205

NYS DEPARTMENT OF ENVIRONMENTAL CONSERVATION
SITE NO. 7-09-009

LOCATION MAP
GLADDING CORDAGE SITE
South Otselic , Chenango Co., NY

PROJECT NO. 37537.100		CONTOUR INTERVAL: 20 ft
SCALE: 1"=2000'	DATE: 10/22/93	FIGURE NO. 1

RUST ENVIRONMENT & INFRASTRUCTURE

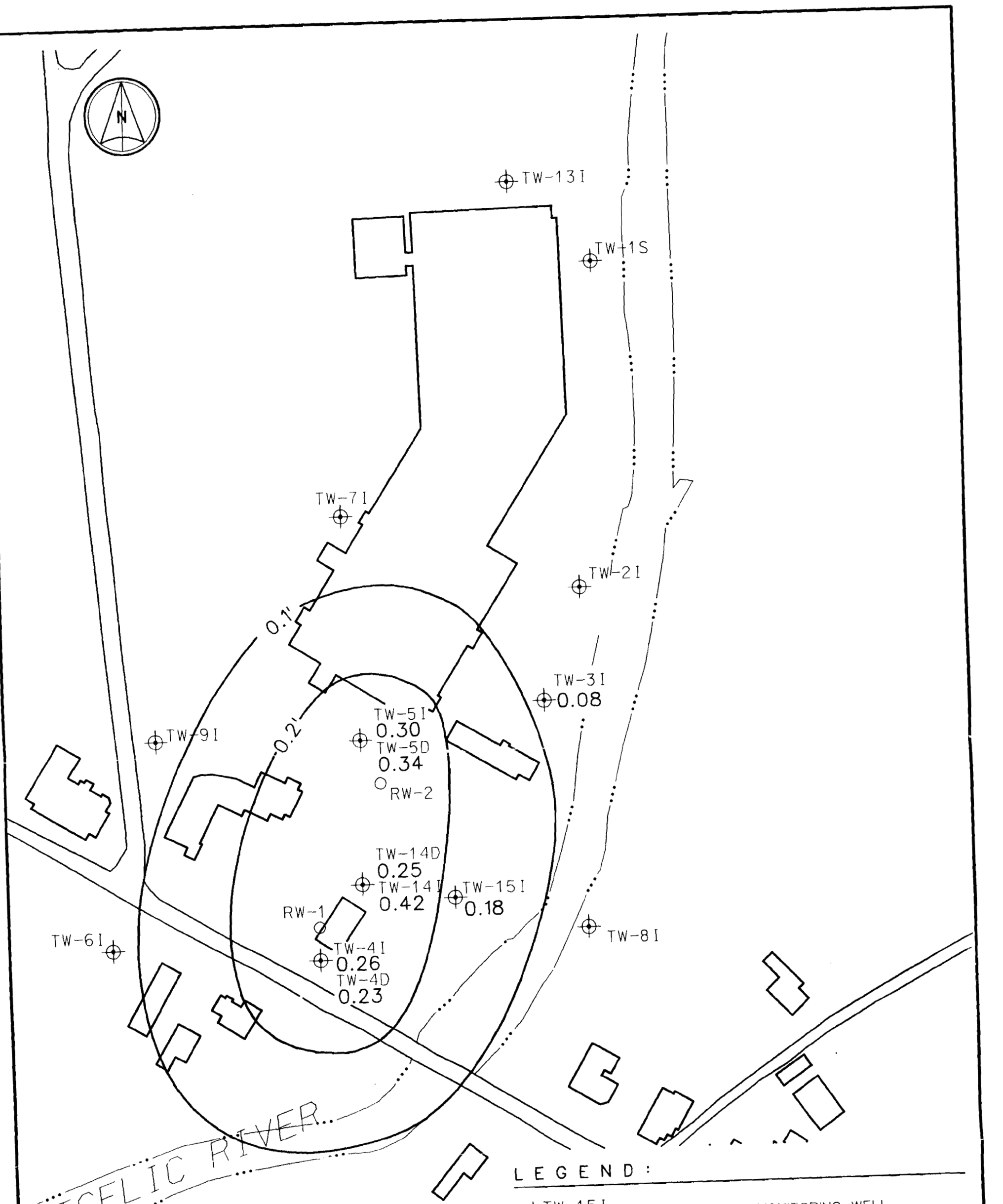


DUNN ENGINEERING COMPANY
DIVISION OF RUST ENVIRONMENT & INFRASTRUCTURE

TCA CONCENTRATION CONTOUR MAP

GLADDING CORDAGE SITE
NYS DEPARTMENT OF ENVIRONMENTAL CONSERVATION
TOWN OF OTSELIC CHENANGO COUNTY, NY

PROJECT No. 37537.002	DATE 9/27/94	DWG. No. 37537-03	SCALE 1"=100'	FIGURE No. 2



DUNN ENGINEERING COMPANY

DIVISION OF RUST ENVIRONMENT & INFRASTRUCTURE

DRAWDOWN CONTOUR MAP AT 30 GPM
FOR BOTH PUMPING WELLS AFTER 100 MINUTES

GLADDING CORDAGE SITE
NYS DEPARTMENT OF ENVIRONMENTAL CONSERVATION
TOWN OF OTSELIC CHENANGO COUNTY, NY

PROJECT No. 37537.002	DATE 9/27/94	DWG. No. 37537-02	SCALE 1"=100'	FIGURE No. 3

N

TW-13
0.07

TW-1
0.05

TW-7
0.36

0.20'

TW-2
0.23

0.50'

TW-3
0.29

TW-9
0.46

TW-5
0.64

RW-2
24.8

1.0'

TW-14
1.15

TW-15
0.43

RW-1
3.5

TW-6
0.41

TW-4
0.69

TW-8
0.26

TW-10D
0.22

OTSELIC RIVER

TW-11
0.00

SCALE 0' 50' 100' 200'

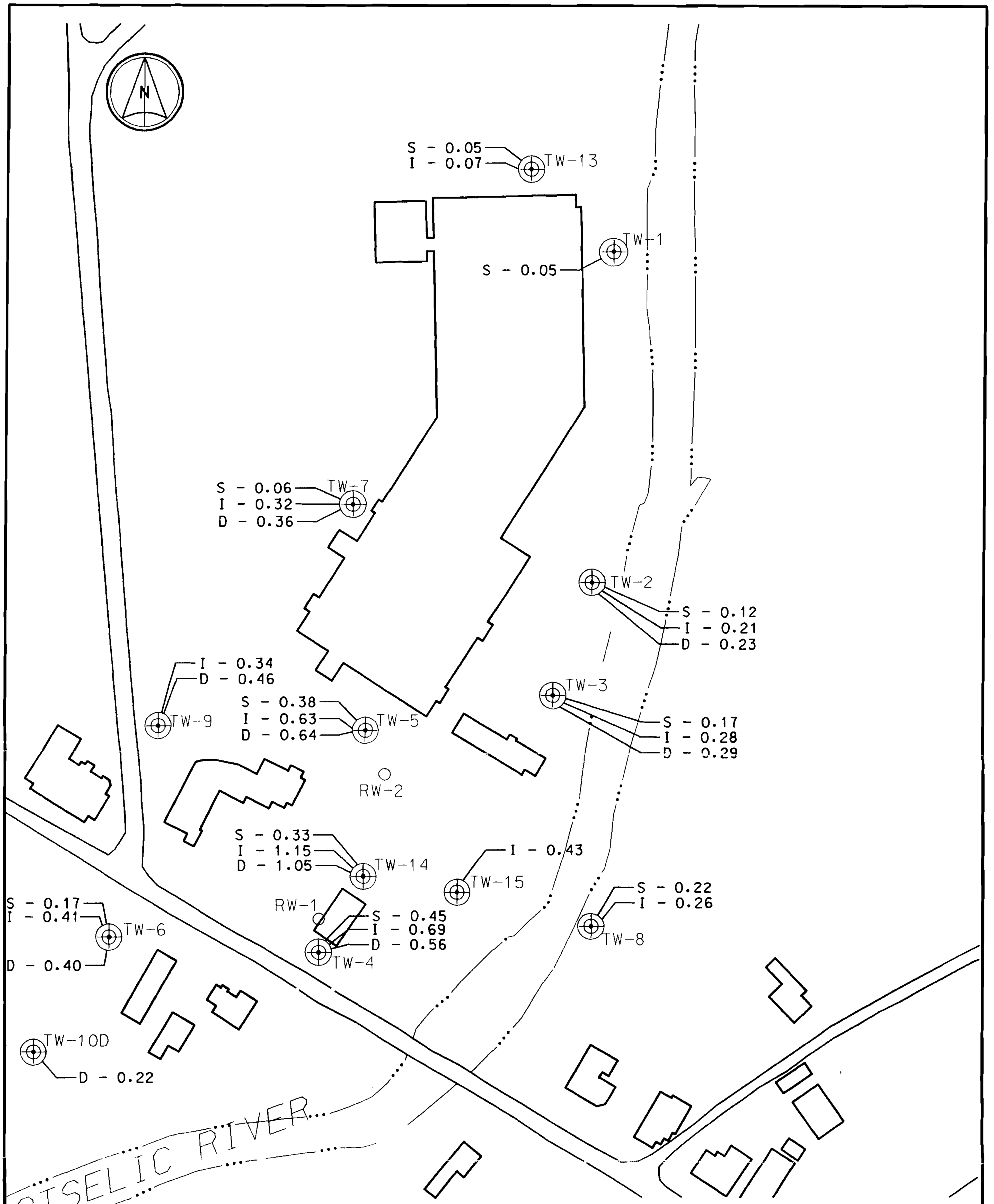
LEGEND:

TW-5 0.64	MONITORING WELL and DRAWDOWN LEVELS (ft.)
RW-2 24.8	RECOVERY WELL and DRAWDOWN LEVELS (ft.)
0.50'	OBSERVED DRAWDOWN CONTOUR (ft.) AFTER 24HRS. WITH RW-1 and RW-2 PUMPING at 50gpm each

DUNN ENGINEERING COMPANY
DIVISION OF RUST ENVIRONMENT & INFRASTRUCTURE

MAXIMUM DRAWDOWN OBSERVED AT EACH WELL CLUSTER DURING 24 HOUR CONSTANT RATE PUMP TEST
(RW-1 and RW-2 BOTH PUMPING AT 50 GPM)
GLADDING CORDAGE SITE
NYS DEPARTMENT OF ENVIRONMENTAL CONSERVATION
TOWN OF OTSELIC CHENANGO COUNTY, NY

PROJECT No. 37537.002	DATE 9/27/94	DWG. No. 37537-05	SCALE 1"=100'	FIGURE No. 4

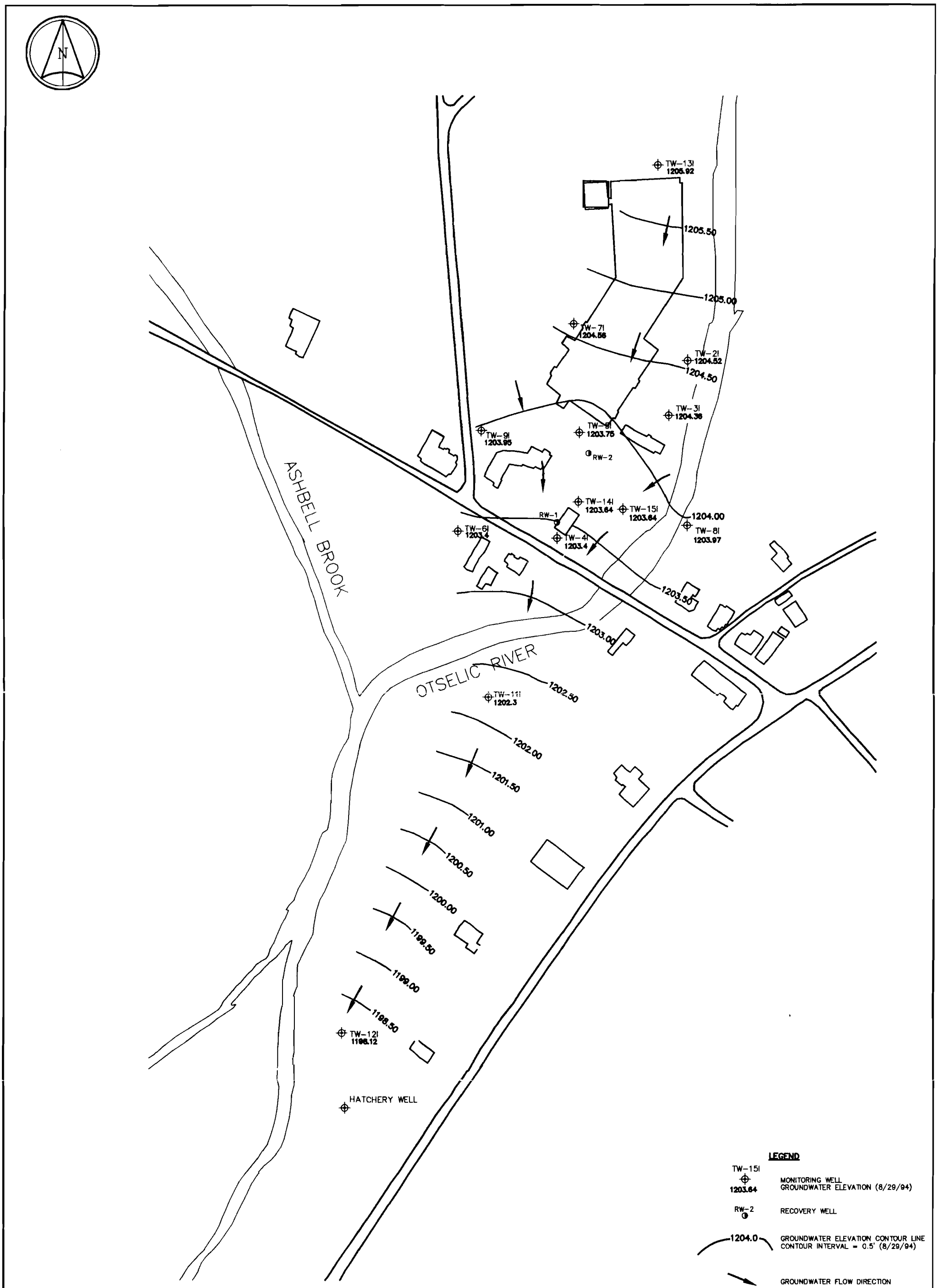


DUNN ENGINEERING COMPANY

DIVISION OF RUST ENVIRONMENT & INFRASTRUCTURE

MAXIMUM DRAWDOWN OBSERVED AT EACH WELL DURING 24 HOUR CONSTANT RATE PUMP TEST
(RW-1 and RW-2 BOTH PUMPING AT 50 GPM)
GLADDING CORDAGE SITE
NYS DEPARTMENT OF ENVIRONMENTAL CONSERVATION
TOWN OF OTSELIC CHENANGO COUNTY, NY

PROJECT No. 37537.002	DATE 9/27/94	DWG. No. 37537-04	SCALE 1"=100'	FIGURE No. 5



DUNN ENGINEERING COMPANY

DIVISION OF RUST ENVIRONMENT & INFRASTRUCTURE

GROUNDWATER ELEVATION CONTOUR MAP INTERMEDIATE WELLS – AUGUST 29, 1994

GLADDING CORDAGE SITE

NYS DEPARTMENT OF ENVIRONMENTAL CONSERVATION

TOWN OF OTSELIC, CHENANGO COUNTY, NY

PROJECT No. 37537.002	DATE 9/21/94	DWG. No. 37537-01	SCALE 1"=200'	FIGURE No. 6

TABLES

Gladding Cordage Site
Monitoring Well Elevations
Table 1.

Well ID	1988 Measuring Point Elevations	1994 Survey (Revised) Surface Elevation	1994 Survey (Revised) Measuring Point Elevation
TW-3s	1213.53	1211.10	1213.60
TW-3i	1213.18	1210.75	1213.19
TW-3d	1213.45	1211.21	1213.47
TW-4s	1212.05	1210.19	1212.06
TW-4i	1212.07	1210.16	1212.08
TW-4d	1212.39	1210.25	1212.39
TW-5s	1211.77	1209.98	1211.78
TW-5i	1211.85	1209.90	1211.89
TW-5d	1212.52	1210.00	1212.55
TW-7s	1213.44	1211.04	1213.48
TW-7i	1213.56	1211.13	1213.60
TW-7d	-	1211.35	1213.25
TW-14s	-	1209.76	1211.81
TW-14i	-	1209.77	1211.77
TW-14d	-	1209.81	1211.85
TW-15i	-	1209.67	1211.52

Notes:
All elevations are in feet above sea level (USGS datum)
- Indicates that the well was not installed at time of survey.

Gladding Cordage Site
1994 Monitoring Well Construction, Development and Survey Information
Table 2.

Monitoring Well	Surface Elevation	Measuring Point Elevation	Boring Depth	Depth to Screen		Elevation of Screen		Sandpack Interval	Bentonite Seal Interval	Volume of Water Removed During Development
				Top	Bottom	Top	Bottom			
TW-7d	1211.35	1213.25	100.5	68.0	78.0	1143.4	1135.3	65.8--79.0	63.0--65.8	152 gallons
TW-14s	1209.76	1211.81	20.0	10.0	20.0	1199.8	1191.8	8.0--20.0	5.8--8.0	46 gallons
TW-14i	1209.77	1211.77	75.0	65.0	75.0	1144.8	1136.8	63.0--75.0	58.5--63.0	200 gallons
TW-14d	1209.81	1211.85	90.0	80.0	90.0	1129.8	1121.9	77.8--90.0	68.5--77.8	140 gallons
TW-15i	1209.67	1211.52	70.0	60.0	70.0	1149.7	1141.5	58.0--70.0	54.3--58	105 gallons

Notes:
Elevations are in feet above sea level (USGS datum).
All depths and intervals expressed as feet below grade.
Each well was equipped with a locking protective steel casing and gripper cap.
All wells are constructed of 2 inch ID Type 304 stainless steel design.

Gladding Cordage Site
Groundwater Recovery Well Construction Details
Table 3.

Well Details	Well ID RW-1	RW-2
Surface Elevation (ft)	1210.03	1210.13
Screen Length (ft)	18.7	12.2
Slot Size (in)	0.095	0.025
Depth to Screen (ft)		
Top	48.3	67.8
Bottom	67.0	80.0
Elevation of Screen (ft)		
Top	1161.73	1142.33
Bottom	1143.03	1130.13
Sandpack Interval (ft)	5.5--67.0	6.0--80.0
Sand pack		
Material Size	#4 Morie	#0 Morie
Amount	4300lbs	5700 lbs
Bentonite Seal Interval	5.5--7.0	4.0--6.0

Gladding Cordage Site
Maximum Drawdown at Each Well
Table 4.

Well ID	RW-1 Pumping 30 gpm	RW-1 Pumping 60 gpm	RW-1 Pumping 100 gpm	RW-2 Pumping 30 gpm	RW-2 Pumping 60 gpm	RW-2 Pumping 80 gpm	RW-1 and RW-2 Pumping Simultaneously 50 gpm each
TW-1S	-	-	-	-	-	-	0.05
TW-2S	-	-	-	-	-	-	0.12
TW-2I	-	-	-	-	-	-	0.21
TW-2D	-	-	-	-	-	-	0.23
TW-3S	-	-	-	-	-	-	0.17
TW-3I	-	-	-	0.075	0.125	0.194	0.28
TW-3D	-	-	-	-	-	-	0.29
TW-4S	0.115	0.242	0.247	0.050	0.077	0.125	0.45
TW-4I	0.122	0.269	0.470	0.137	0.274	0.369	0.69
TW-4D	0.084	0.175	0.297	0.147	0.280	0.368	0.56
TW-5S	0.060	0.108	0.184	0.060	0.130	0.248	0.38
TW-5I	0.100	0.186	0.306	0.192	0.398	0.528	0.63
TW-5D	0.090	0.184	0.301	0.240	0.450	0.561	0.64
TW-6S	-	-	-	-	-	-	0.17
TW-6I	-	-	-	-	-	-	0.41
TW-6D	-	-	-	-	-	-	0.40
TW-7S	-	-	-	-	-	-	0.06
TW-7I	-	-	-	-	-	-	0.32
TW-7D	-	-	-	-	-	-	0.36
TW-8S	-	-	-	-	-	-	0.22
TW-8I	-	-	-	-	-	-	0.26
TW-9I	-	-	-	-	-	-	0.34
TW-9D	-	-	-	-	-	-	0.46
TW-10D	-	-	-	-	-	-	0.22
TW-11S	-	-	-	-	-	-	0.00
TW-11I	-	-	-	-	-	-	0.00
TW-12I	-	-	-	-	-	-	0.03
TW-12D	-	-	-	-	-	-	0.03
TW-13S	-	-	-	-	-	-	0.05
TW-13I	-	-	-	-	-	-	0.07
TW-14S	0.141	0.291	0.510	0.073	0.142	0.237	0.33
TW-14I	0.340	0.717	1.250	0.080	0.168	0.266	1.10
TW-14D	0.080	0.186	0.330	0.173	0.357	0.466	1.08
TW-15I	0.052	0.126	0.211	0.110	0.198	0.252	0.43
RW-1	2.210	3.690	6.690	0.069	0.162	0.270	3.52
RW-2	0.080	0.163	0.270	1.455	9.002	28.500	24.76

Gladding Cordage Aquifer Test Analysis
Using Streltsova's (1974) Curve Fitting Method for
Partial Penetrating Recovery and Monitoring Wells
Table 5.

Well Setup				Part A Results			Part B Results		
Well ID	Interference Effects	Radial Distance (ft)	Pumping Rate (gpm)	Transmissivity (ft^2/day)	Hydraulic conductivity (ft/day) (cm/s)	Storativity (Sa)	Transmissivity (ft^2/day)	Hydraulic conductivity (ft/day) (cm/s)	Storativity (Sy)
TW-4i	RW- 1 primary pumping RW-2 interference	35	50	1794.489	19.99 7.03E-03	5.66E-03	4670.368	51.893 1.83E-02	7.63E-01
TW-5i	RW-2 primary pumping RW-1 interference	37	50	1795.998	19.956 7.04E-03	1.57E-03	5631.915	62.577 2.21E-02	4.94E-01
TW-14i	RW- 1 primary pumping RW-2 interference	56	50	785.089	8.723 3.08E-03	3.00E-04	1556.789	17.298 6.10E-03	1.49E-01
TW-15i	NO interference	149	100	4995.263	55.503 1.96E-02	3.33E-04	9284.126	103.157 3.64E-02	1.00E-01

Gladding Cordage Site
Preliminary Results of Water Quality Analyses
Recovery Well Pumping Tests
Table 6

Type of Test & Pumping Rate	Recov. Well RW-1 1,1,1-TCA	Recov. Well RW-2 1,1,1-TCA	Combined Sample (100 gpm) 1,1,1-TCA	iron	manganese	calc hardness	alkalinity	TDS	TSS
	ug/l	ug/l	ug/l	ug/l	ug/l	mg/l	mg/l	mg/l	mg/l
Step-Rate each well									
30 gpm									
start	110	130							
finish	120	120							
60 gpm									
finish	110	99							
80 gpm									
finish	-	110							
100 gpm									
finish	130	-							
Constant-Rate both wells									
50 gpm each well									
start	130	110							
finish	130	88	160	48.1	153	160	188	194	0.8
Carbon Effluent									
mid-test			0						

Duration of each step for the step-rate test was 100 minutes; duration of constant rate test was 24 hours.
At finish of constant rate test: temperature was 11.0-10.6 deg C, pH was 7.6-7.7, Spec. cond. was 317-276 mS/cm, and turbidity was 0 in RW-1 and RW-2, respectively.

GLADDING CORDAGE SITE
GROUNDWATER QUALITY DATA
Trichloroethane (TCA) concentrations in Groundwater (ppb)
Table 7.

Well Id	Nov.-86	Dec.-86	Jul.-87	Jul.-88	Aug.-88	Oct.-88	Jan.-89	Jan.-90	Mar.-91	Dec.-91	May-93	Oct.-93	Jul.-94	Average Concentration since Jan.-90
TW1	5	227	5	ND	4	ND	-	ND	10	ND	-	ND	ND	10*
TW2S	37	497	11	1	10	3	-	ND	39	6	125	6	18	39
TW2I	-	-	-	-	-	11	15	2	16	25	75	ND	20	28
TW2D	0	-	-	-	-	20	14	4	6	26	20	2	8	11
TW3S	263	437	160	26	85	32	34	42	28	48	40	36	25	37
TW3I	-	-	-	-	-	14	21	8	16	32	100	37	33	38
TW3D	-	-	-	-	-	5	5	ND	ND	5	ND	1	3	3
TW4S	178	103	17	7	23	18	18	10	8	175	15	64	22	49
TW4I	11	31	8	11	8	17	38	39	54	97	250	110	90	107
TW4D	-	-				5	6	4	3	9	ND	2	9	5
TW5S	4	475	659	150	422	270	130	59	14	190	40	63	38	67
TW5I	186	243	111	99	116	190	320	180	83	180	500	215	154	219
TW5D	-	-	-	-	-	150	150	120	74	150	300	42	80	128
TW6S	-	-	-	-	-	3	-	ND	ND	ND	ND	2	1	2
TW6I	-	-	-	-	-	ND	-	15	5	20	15	8	6	12
TW6D	-	-	-	-	-	ND	-	ND	ND	ND	ND	ND	ND	ND
TW7S	-	-	-	-	-	79	150	74	10	50	35	57	31	43
TW7I	-	-	-	-	-	110	ND	150	34	185	75	88	44	96
TW7D	-	-	-	-	-	-	-	-	-	-	-	-	16	16*
TW8S	-	-	-	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND
TW8I	-	-	-	-	-	ND	-	ND	ND	ND	ND	ND	ND	ND
TW9I	-	-	-	-	-	3	4	3	ND	7	15	5	4	7
TW9D	-	-	-	-	-	ND	-	ND	ND	ND	ND	ND	ND	ND
TW10D	-	-	-	-	-	4	ND	ND	4	ND	ND	ND	ND	ND
TW11S	-	-	-	-	-	17	ND	9	14	45	30	6	9	19
TW11I	-	-	-	-	-	17	ND	13	9	55	50	21	16	27
TW12I	-	-	-	-	-	ND	-	-	7	60	30	8	10	23
TW12D	-	-	-	-	-	ND	-	-	-	-	ND	ND	ND	ND
TW13S	-	-	-	-	-	ND	-	-	-	-	-	ND	-	ND
TW13I	-	-	-	-	-	ND	-	-	-	-	-	ND	-	ND
TW14S	-	-	-	-	-	-	-	-	-	-	-	-	118	118*
TW14I	-	-	-	-	-	-	-	-	-	-	-	-	39	39*
TW14D	-	-	-	-	-	-	-	-	-	-	-	-	90	90*
TW15I	-	-	-	-	-	-	-	-	-	-	-	-	94	94*

Notes:
ND - indicates no TCA detected.
- - indicates no sample taken.
* - indicates only one sample.

Gladding Cordage Site
Groundwater Elevations
Table 8.

Well ID	Oct-88	Jan-89	Feb-89	Jun-89	Sep-89	Jan-90	Mar-90	Dec-91	May-91	Oct-93	Aug-94
TW 1S	1205.37	-	1206.72	1205.98	1205.98	1206.21	1206.27	1206.02	-	1205.51	1205.85
TW 2S	1204.06	-	1205.44	1204.96	1204.83	1204.99	1205.05	1204.94	1203.78	1204.33	1204.63
TW 2I	1203.70	1204.15	1205.23	1204.68	1204.64	1204.58	1204.85	1204.81	1204.60	1204.15	1204.52
TW 2D	1203.64	1203.94	1205.11	1204.61	1204.40	1204.73	1204.84	1205.44	1204.60	1204.10	1204.51
TW 3S	1203.53	1204.13	1204.96	1205.45	1206.24	1204.22	1206.03	1204.53	1204.29	1204.93	1204.32
TW 3I	1203.38	1203.78	1204.94	1204.53	1204.39	1204.98	1204.68	1204.86	1204.47	1203.96	1204.36
TW 3D	1203.35	1204.05	1204.85	1204.45	1204.37	1204.61	1204.61	1205.23	1204.45	1204.16	1204.36
TW 4S	1202.45	1202.75	1203.72	1203.30	1203.05	1203.12	1203.72	1203.53	1203.61	1203.04	1203.48
TW 4I	1202.17	1202.67	1203.64	1203.07	1202.99	1203.33	1203.57	1204.21	1203.56	1202.99	1203.40
TW 4D	1202.19	1202.69	1203.74	1203.39	1203.18	1203.43	1203.55	1203.44	1203.57	1203.04	1203.43
TW 5S	1202.77	1203.50	1204.35	1203.81	1203.67	1204.08	1204.61	1204.77	1204.27	1203.53	1204.01
TW 5I	1202.20	1203.15	1204.12	1203.52	1203.50	1203.76	1204.10	1203.73	1203.84	1203.28	1203.75
TW 5D	1202.07	1203.02	1203.93	1203.69	1203.52	1203.71	1203.94	1203.58	1203.72	1203.18	1203.63
TW 6S	1201.59	1202.49	1203.44	1202.97	1202.81	1203.07	1203.47	1204.16	1206.33	1202.77	1203.09
TW 6I	1201.71	-	1203.84	1203.40	1203.21	1203.35	1203.76	1204.42	1203.59	1202.80	1203.40
TW 6D	1201.69	-	1203.81	1203.34	1203.11	1203.44	1203.69	1204.22	1203.54	1202.97	1203.38
TW 7S	1203.94	1204.54	1205.29	1205.31	1205.17	1204.95	1205.77	1205.56	1205.23	1204.49	1204.92
TW 7I	1203.66	1204.16	1205.20	1204.89	1204.73	1204.65	1205.02	1205.40	1205.03	1204.13	1204.56
TW 7D	-	-	-	-	-	-	-	-	-	-	1204.40
TW 8S	1203.09	-	1204.39	1203.66	1203.79	1204.11	1204.21	1204.95	1203.85	1203.72	1203.97
TW 8I	1203.01	-	1204.30	1203.63	1203.46	1204.11	1204.03	1205.09	1203.94	1203.51	1203.97
TW 9I	1202.77	1203.42	1204.35	1203.97	1203.84	1203.87	1204.56	1204.64	1204.04	1203.47	1203.95
TW 9D	1202.40	-	1204.17	1203.55	1203.34	1203.81	1204.38	1204.53	1203.96	1203.24	1203.76
TW 10D	1200.79	1202.34	1203.55	1202.92	1202.84	1203.04	1203.24	1203.96	1204.29	1202.86	1203.03
TW 11S	1201.26	1201.71	1203.12	1201.84	1201.88	1202.34	1202.39	1203.76	1202.53	1203.70	1202.28
TW 11I	1201.31	1201.81	1203.05	1201.81		1202.53	1202.56	1203.64	1202.55	1202.50	1202.30
TW 12I	1198.30	-	1199.14	1197.95	1197.45	1198.37	1198.20	1198.91	1198.27	1198.63	1198.12
TW 12D	1198.42	-	1199.27	1198.16	1197.70	1198.56	1198.37	1198.12	1198.50	1198.81	1198.30
TW 13S	1205.08	-	1206.98	1205.79	1205.83	1206.19	1206.67	1206.04	-	1205.57	1205.93
TW 13I	1204.84	-	1206.47	1205.76	1205.54	1205.97	1206.73	1206.14	-	1205.46	1205.92
TW 14S	-	-	-	-	-	-	-	-	-	-	1203.69
TW 14I	-	-	-	-	-	-	-	-	-	-	1203.64
TW 14D	-	-	-	-	-	-	-	-	-	-	1203.52
TW 15I	-	-	-	-	-	-	-	-	-	-	1203.64

APPENDIX A

NUMERICAL GROUNDWATER FLOW MODEL

NUMERICAL GROUNDWATER FLOW MODELING GLADDING CORDAGE COMPANY

Prepared for:
New York State
Department of Environmental Conservation

Prepared by:
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Barrington Commons
208 White Horse Pike, Suite 13
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April, 1994

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1.0 INTRODUCTION

1.1 GENERAL

RUST Environment & Infrastructure (RUST) has been retained by New York State Department of Environmental Conservation (NYSDEC) to design an extraction system at the Gladding Cordage Company site, South Otselic, New York. The goal of the proposed remedial action is to control the area of groundwater degradation with TCA concentrations above 100 µg/l.

A numerical groundwater flow model was used to evaluate potential pumping scenarios and groundwater constituents travel times. In addition, the numerical groundwater flow model was used to assist in the design of a proposed pumping test at the site.

Details of the site setting are presented in the "Preliminary Draft Remedial Investigation Report Gladding Cordage Company Site, South Otselic, Chenango County, New York (June, 1989), prepared by GHR Engineering Associates, Inc. (RI report). The RI report was used as a data source for the design of the extraction system at the site. A brief presentation of the site geology, hydrogeology and groundwater chemistry with references to the RI report figures, plates and tables is presented below.

1.2 SITE SETTING

1.2.1 Site Geology

The site is located in the Appalachian Uplands physiographic province. The bedrock consists of Upper Devonian sandstones, shales and limestones. The bedrock dips regionally at a low angle (up to 10 degrees) to the south-southwest. Structural contours to the top of bedrock are presented in Plate 6 of the RI report.

Pleistocene unconsolidated glacial deposits (till, outwash and glacio-lacustrine sediments) overlie the bedrock, and Recent Holocene unconsolidated deposits are present along the river valleys. The thickness of the unconsolidated deposits at the site varies from 50 feet in the northern part of the site to 110 feet in the southern part of the site (see geologic sections presented in Plate 7 of the RI report).

1.2.2 Site Hydrogeology

The site is located in the Otselic River valley. This valley is part of the Tioughnioga tributary system of the Susquehanna River basin. The main aquifers in the region are represented by stratified drift aquifers located along the broad valleys. The bedrock and till aquifers produce on average much lower yields (0.5 gpm to 8 gpm) than the stratified drift aquifers (400 gpm).

In the site area the main aquifer is developed in the unconsolidated Pleistocene and Holocene deposits. This upper aquifer was the focus of the RI site investigation. During the RI field investigation a series of shallow intermediate and deep cluster wells were installed. Slug testing and water level measurements allowed the hydrogeologic characterization of the aquifer materials.

The hydraulic conductivity of the aquifer ranges from 2.9 ft/day to 33.5 ft /day ($3.5x10^{-3}$ cm/s to $1.2x10^{-2}$ cm/s) with an average of 14 ft/day ($5x10^{-3}$ cm/s; see Table 3-3 in the RI report). The vertical distribution of the hydraulic conductivity data does not suggest the presence of continuous confining units. At the scale of the study area the aquifer seems to display a relative homogeneous distribution of hydraulic conductivity as indicated by the results of the hydrogeologic testing (see Table 3-3 in the RI report).

The groundwater level data (see Table 3-4 in the RI report) indicated that horizontal hydraulic gradients range from $2x10^{-3}$ ft/ft to $8x10^{-3}$ ft/ft. The vertical hydraulic gradients range from an upward gradient of $+4x10^{-3}$ ft/ft to a downward gradient of $-2x10^{-2}$ ft/ft (see Table 4-4 in the RI report). The general groundwater flow direction is from north to south. The area north of cluster well TW-4 is an aquifer recharge zone, characterized by downward hydraulic gradients. In this area the Otselic River is a loosing stream (water from the river is recharging the aquifer). South of cluster well TW-4 the aquifer presents upward hydraulic gradients indicating a tendency of the aquifer to discharge into the Otselic River. Figure 1, attached, presents the monitoring well locations and the extent of the modeling grid. Plates 9 to 11 in the RI report present the groundwater elevation contours and interpreted flow paths.

1.2.3 Groundwater Chemistry

The RI field investigation indicated the presence of a volatile organic compound (VOC) plume at the site. Plate 12 in the RI report presents the interpreted total volatile organic isoconcentration contours for October 1988 sampling event. The main constituent of the plume is 1,1,1-trichloroethane (TCA). Figure 2 (attached) presents the outline of the 100 µg/l TCA isoconcentration contour for 1993 sampling events.

2.0 ANALYSIS

2.1 GROUNDWATER FLOW MODEL SET-UP

Following is a brief presentation of the boundary conditions and input parameters for the MODFLOW groundwater flow model (McDonald and Harbaugh, 1984).

Finite Difference Grid and Boundary Conditions

The MODFLOW model uses a block centered grid. A finite difference grid of 130 rows and 80 columns with an equal grid spacing of 20 feet (2600 feet x 1600 feet) was selected for the groundwater flow simulation. To account for partial penetration conditions the aquifer was simulated using three layers. The modeling layers correspond with the shallow, intermediate and deep sections of the aquifer (layers 1, 2 and 3, respectively).

The Otselic River and Ashbell Brook were simulated by defining "river nodes" within layer 1 of the modeling grid. The following parameters were used for the definition of the river nodes:

- The surface water elevation of the Otselic River was decrease in stages from 1,207 ft in the northern part of the grid (upstream) to 1,198 feet in the southern part of the grid (downstream) in accordance with the topographic map of the area;
- The surface water elevation of the Ashbell Brook was decreased in stages from 1,204 ft in the northwestern part of the grid to 1,201 ft at the confluence with Otselic River;
- The river bottom elevation was calculated as the surface water elevation minus the estimated surface water thickness (5 ft) minus the estimated river bed thickness (5 ft);
- Hydraulic conductivity of the river bed was assumed to be 0.03 ft/day ($1x10^{-5}$ cm/s) in the northern part of the grid (loosing stream area) and 1.4 ft/day ($5x10^{-4}$ cm/s) in the southern part of the grid (gaining stream area);

- River bed conductance calculations are presented in Table 1 (attached).

Constant head boundary conditions were set for all the layers along the northern and southern sides of the model. The values assigned to the constant head cells were taken from the interpreted groundwater elevation contours for October 3 to October 6, 1988 (Plates 9 to 11 in the RI report).

Hydraulic Conductivity

The average hydraulic conductivity value of 14 ft/day ($5x10^{-3}$ cm/s) was assigned for the major portion of the modeling layers. Within layers 2 and 3 hydraulic conductivities of 20 ft/day and 25 ft/day, respectively, were used along the Otselic River channel. This is in accordance with site data which indicates increased hydraulic conductivity in the vicinity of the river. It is expected that along the main outwash channels (the ancestral Otselic River channel) the hydraulic conductivity will be higher because the coarser, more permeable material tends to be deposited along the center of the valley (high energy deposits).

Base of the Aquifer

The base of the aquifer was considered to be the top of the bedrock surface. The bottom elevation of modeling layer 3 was input in accordance with the top of bedrock structural contours presented in Plate 6 of the RI report. The bottom elevations of modeling layers 2 and 1 were input as intermediate elevations between the bedrock elevation and the average ground surface elevation.

Precipitation Recharge

The net precipitation recharge assigned to the model was 11.3 inches/year (2.6×10^{-3} ft/day) in accordance with Section 4.2.2.1 of the RI report.

2.2 GROUNDWATER FLOW MODEL CALIBRATION

The goal of the model calibration was to obtain simulated hydraulic heads similar to the measured water level data. The October 3 to October 6, 1988 water level data set was used as a target for model calibration. Figure 3 (attached) presents the simulated hydraulic heads and the differences between measured versus simulated heads. Table 2 (attached) includes a summary of these differences. As can be seen, the average head difference is -0.12 ft.

3.0 RESULTS

3.1 PUMPING TEST SIMULATION

The pumping test simulation results are presented in Figures 4, 5 and 6, attached. The pumping well (EW1) was located approximately 50 ft upgradient of cluster wells TW-4. The simulated pumping rate was 50 gpm. For convenience, the pumping well was considered to be screened in the central part of the aquifer (modeling layer 2).

The attached figures (Figures 4 to 6) show the simulated drawdown contours after 24 hours of pumping. As can be seen, the drawdown cone could extend more than 200 ft radially from the pumping well. The monitoring wells within the area of influence of the pumping well could be used as observation wells for the pumping test.

3.2 CAPTURE ZONE ANALYSIS AND TRAVEL TIME ESTIMATIONS

The goal of an extraction system at the site is to control the portion of the TCA plume that has concentrations higher than 100 µg/l. The computer code MODPATH (Pollok, 1990) was used to estimate the effectiveness of pumping scenarios at the site. Particles were set along the 100 µg/l TCA isoconcentration contours and pumping rate and well locations were changed until all particles were controlled by the extraction well.

The capture zone analysis indicate the following:

- The plume can be controlled by one extraction well pumping at a rate of about 50 gpm (Scenario A; see Figure 7, attached);
- A two well scenario can be used to control the TCA plume (Scenario B). The extraction wells (EW1 and EW2) were located along the plume axis. The total pumping rate is estimated to be at 50 gpm, 25 gpm for each well (see Figure 8, attached).

The second scenario presents the advantage that the extraction system performance is not dependant on only one well. The repairs and instrumentations could be completed by shutting off one of the wells, while the other would still be pumping. This would result in greater security of plume control when in comparison with the one extraction well scenario.

The computer code MODPATH was used to estimate the travel time required to remove the TCA plume with concentrations higher than 100 µg/l. This estimate is based on several simplifying assumptions listed below:

- The advective contaminant flow is dominant in the transport process and the dispersive contaminant flux can be neglected;
- The retardation factor of TCA for the site conditions is 2;
- No source of TCA is currently present at the site which would continue to pollute the groundwater.

Based on these assumptions, travel time lines were calculated. The travel time lines show the distribution of the 100 µg/l contours after the specified number of years.

The comparison of the two scenarios shows that with one pumping well approximately 5 years would be required for the removal of TCA plume with concentrations higher than 100 µg/l. Two pumping wells (Scenario B) would remove the plume in approximately 3 years.

These travel time simulations should be viewed as estimates only and as a tool for comparison of the efficiency of the two considered pumping scenarios. Specific site conditions may result in a longer time frame for contaminant removal.

4.0 RECOMMENDATIONS

Based on the results of the preliminary numerical groundwater flow modeling the following are recommended:

- Install a groundwater pumping well (EW1) at a location approximately 50 ft upgradient from well cluster TW-4. This pumping well can be used for the proposed 24-hour constant rate pumping test. In addition, this well can be used as a permanent groundwater extraction well to control the on-site TCA plume;
- Install a set of shallow, intermediate and deep observation wells at a location between EW1 and the upgradient well cluster TW-5;
- As a minimum, during the constant rate pumping test, monitor the observation wells included in the area of influence of the pumping well (Figures 4 to 6);
- Consider a two pumping well scenario for the design of the extraction system; and,
- Refine the numerical groundwater flow model following the analysis of the pumping test.

We trust this report is satisfactory for your current requirements.

Very truly yours,

RUST Environment & Infrastructure

Mitrofan Josan, C.P.G.
Senior Hydrogeologist/Geophysicist

Richard C. F. King, P.Eng.
Department Manager

TABLE 2
SUMMARY OF GROUNDWATER FLOW MODEL CALIBRATION

WELL NAME	TARGET HEAD	MODEL HEAD	RESIDUAL
TW-2S	1204.06	1203.67	0.39
TW-3S	1203.53	1203.27	0.26
TW-4S	1202.45	1202.28	0.17
TW-5S	1202.77	1202.95	-0.18
TW-6S	1201.59	1202.02	-0.43
TW-7S	1203.94	1203.77	0.17
TW-8S	1203.09	1202.75	0.34
TW-11S	1201.26	1201.14	0.12
TW-13S	1205.08	1205.26	-0.18
TW-2I	1203.70	1203.65	0.05
TW-3I	1203.38	1203.27	0.11
TW-4I	1202.17	1202.26	-0.09
TW-5I	1202.20	1202.99	-0.79
TW-6I	1201.71	1202.03	-0.32
TW-7I	1203.66	1203.67	-0.01
TW-8I	1203.01	1202.67	0.34
TW-9I	1202.77	1202.70	0.07
TW-11I	1201.31	1201.19	0.12
TW-12I	1198.30	1198.74	-0.44
TW-13I	1204.84	1205.25	-0.41
TW-2D	1203.64	1203.65	-0.01
TW-3D	1203.35	1203.24	0.11
TW-4D	1202.19	1202.26	-0.07
TW-5D	1202.07	1202.95	-0.88
TW-6D	1201.69	1201.98	-0.29
TW-9D	1202.40	1202.76	-0.36
TW-10D	1200.79	1201.59	-0.80
TW-12D	1198.42	1198.75	-0.33

----- Summary Statistics For Entire Model -----

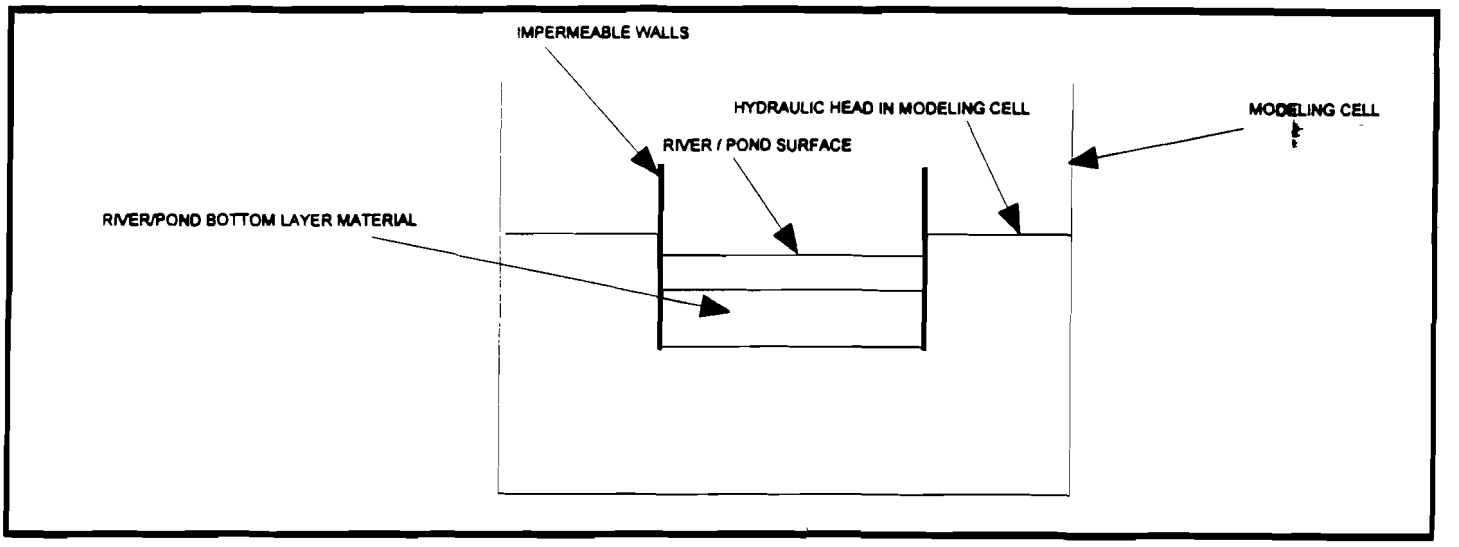
Residual Mean	= -0.119703
Residual Standard Dev.	= 0.341232
Residual Sum of Squares	= 3.661500
Absolute Residual Mean	= 0.279739
Minimum Residual	= -0.883491
Maximum Residual	= 0.387148

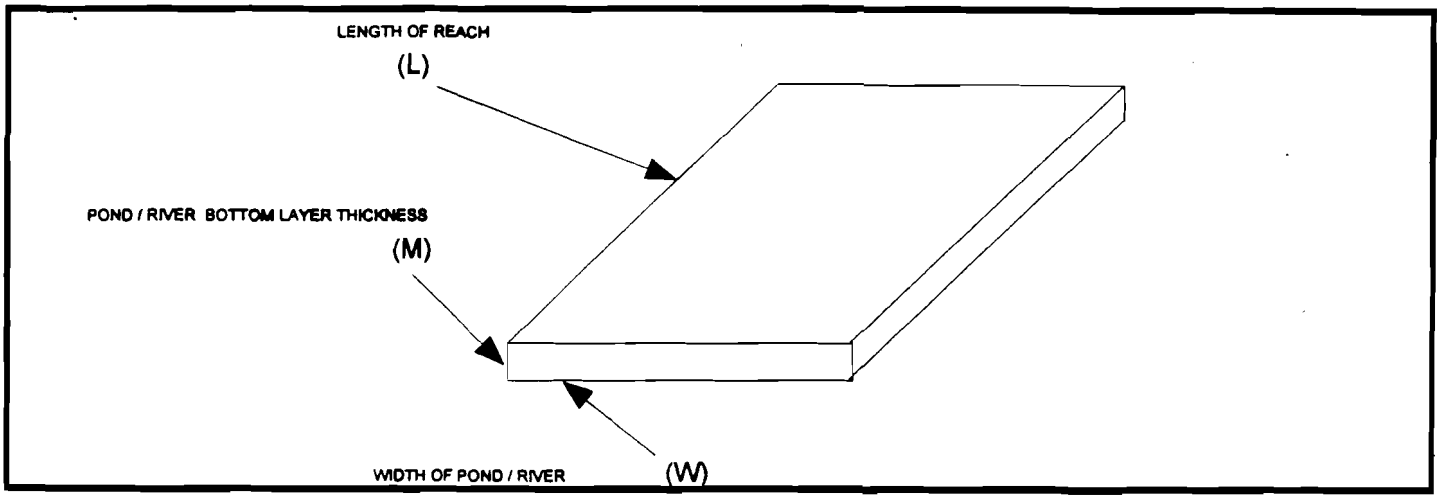
Why impermeable walls?

TABLE 1

CALCULATION OF STREAMBED CONDUCTANCE FOR AN INDIVIDUAL MODELING CELL

UNIT	POND / RIVER BOTTOM LAYER THICKNESS M (FT)	HYDRAULIC CONDUCTIVITY OF THE BOTTOM LAYER MATERIAL K (CM/S)	K (FT/DAY)	WIDTH OF THE POND / RIVER WITHIN A MODELING CELL W (FT)	LENGTH OF REACH WITHIN A MODELING CELL L (FT)	STREAMBED CONDUCTANCE C = KLW/M (sqFT/DAY)
RECHARGE POND (MIN)	5.00	1E-05	0.03	20.00	20.00	2.40
RECHARGE POND (MAX)	5.00	5E-04	1.40	20.00	20.00	112





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TW-13S	1205.08	1205.26	-0.18
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TW-3I	1203.38	1203.27	0.11
TW-4I	1202.17	1202.26	-0.09
TW-5I	1202.20	1202.99	-0.79
TW-6I	1201.71	1202.03	-0.32
TW-7I	1203.66	1203.67	-0.01
TW-8I	1203.01	1202.67	0.34
TW-9I	1202.77	1202.70	0.07
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TW-12I	1198.30	1198.74	-0.44
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TW-3D	1203.35	1203.24	0.11
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TW-5D	1202.07	1202.95	-0.88
TW-6D	1201.69	1201.98	-0.29
TW-9D	1202.40	1202.76	-0.36
TW-10D	1200.79	1201.59	-0.80
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—— Summary Statistics For Entire Model ——

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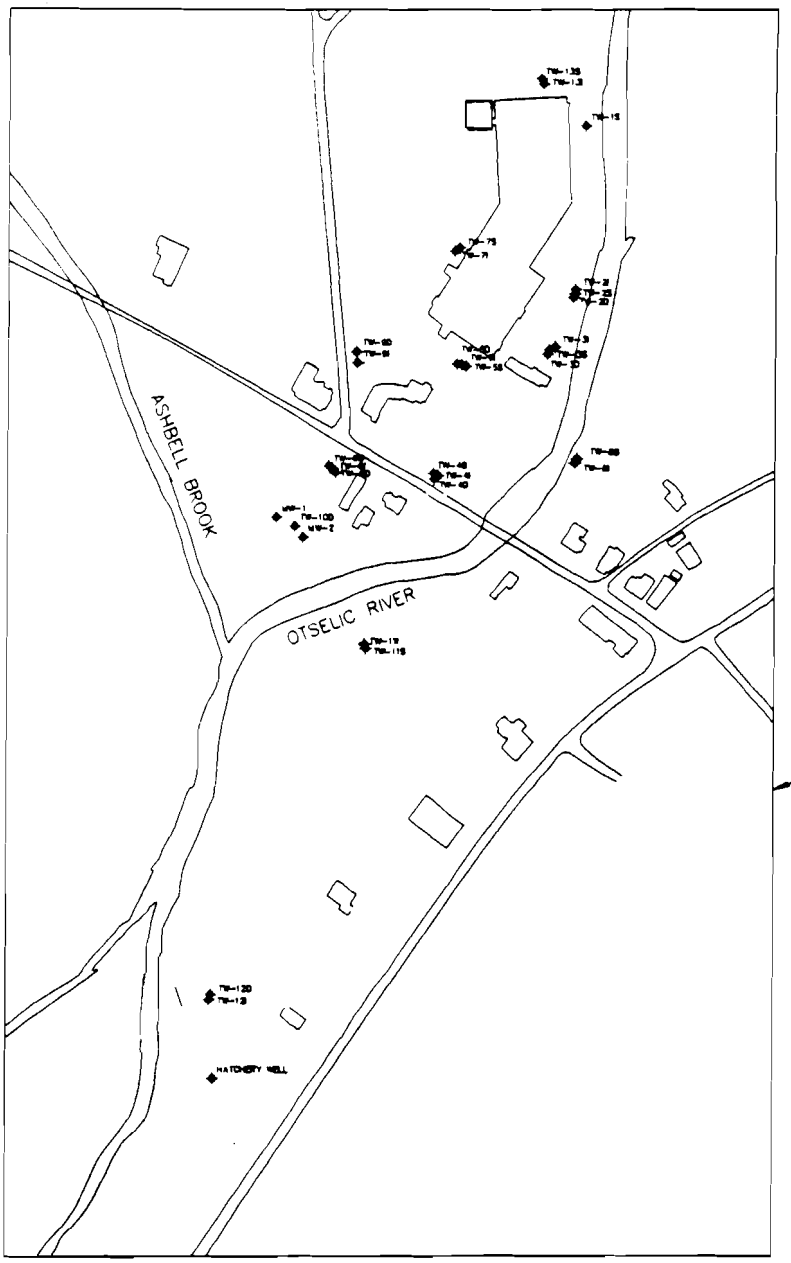
Minimum Residual	= -0.883491
Maximum Residual	= 0.387148

Plot Location



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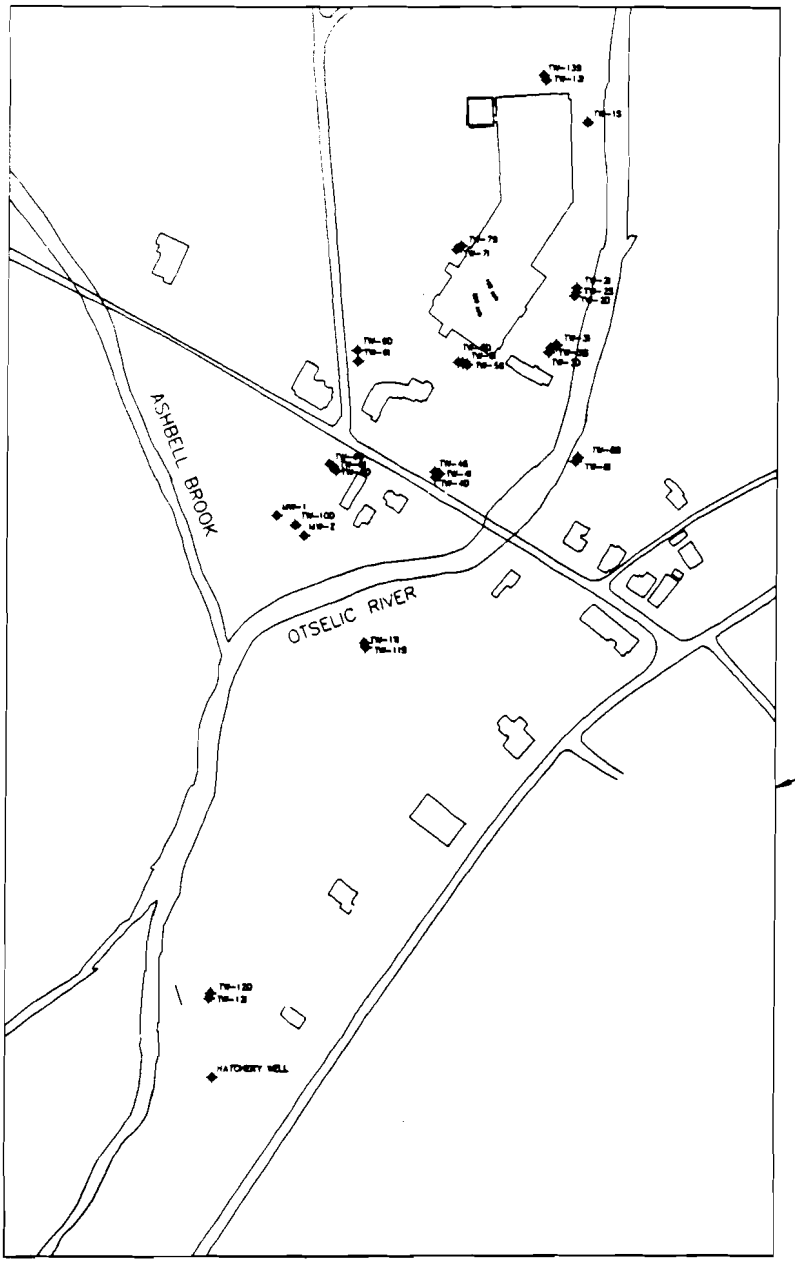
	DRAWN MJ	DATE 3/28/94	
	CHECKED FG	DWG No GL01.DWG	
PREPARED BY RUST ENVIRONMENT & INFRASTRUCTURE	PROJECT GLADDING		FIGURE 1



fix title - add contours

CLIENT NYSDEC	JOB No 37537 002	SCALE AS SHOWN	INTERPRETED TCA CONCENTRATIONS CONTOURS (1993)
	DRAWN MJ	DATE 3/28/94	
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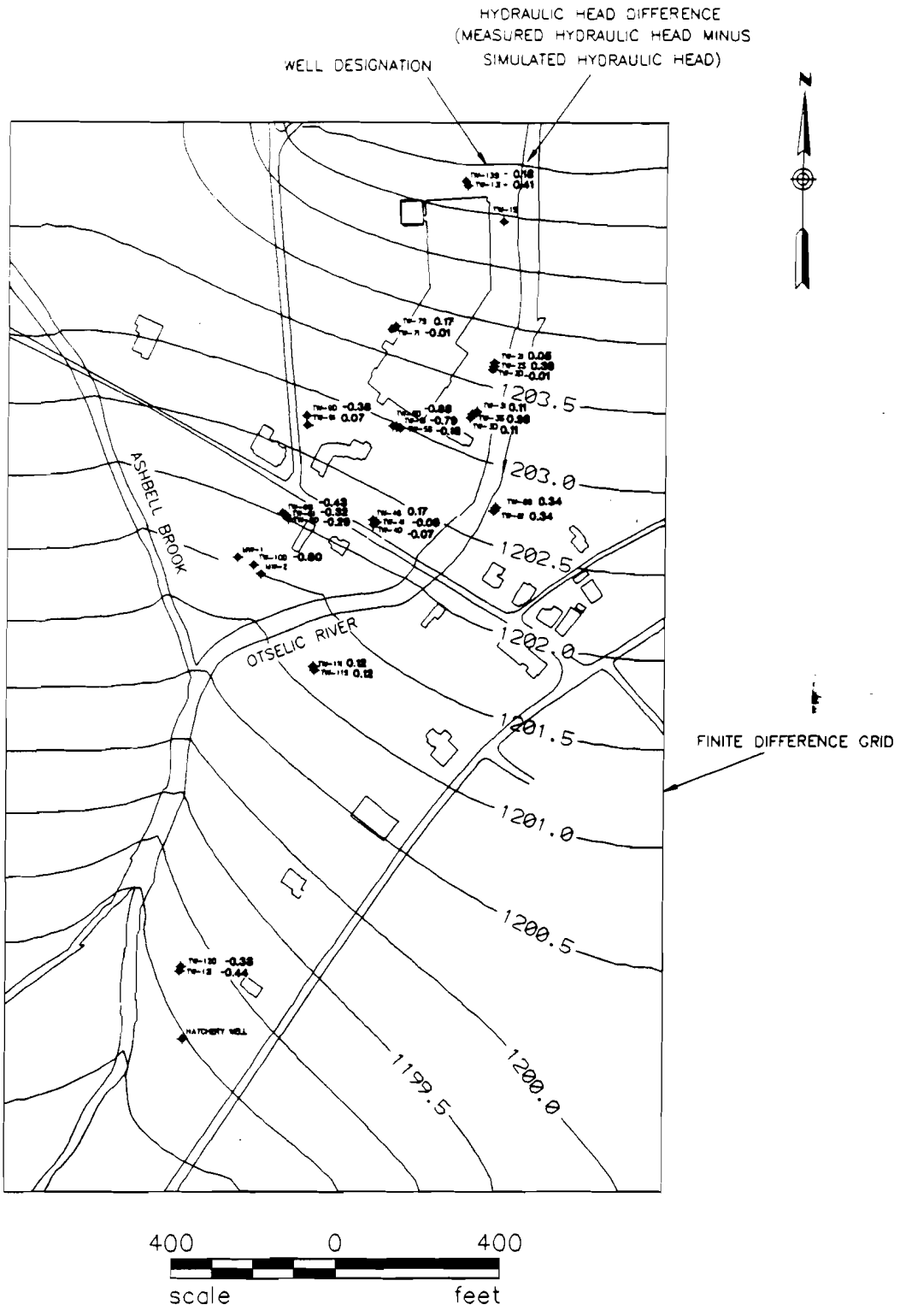
PREPARED BY RUST ENVIRONMENT & INFRASTRUCTURE	PROJECT GLADDING		FIGURE 2



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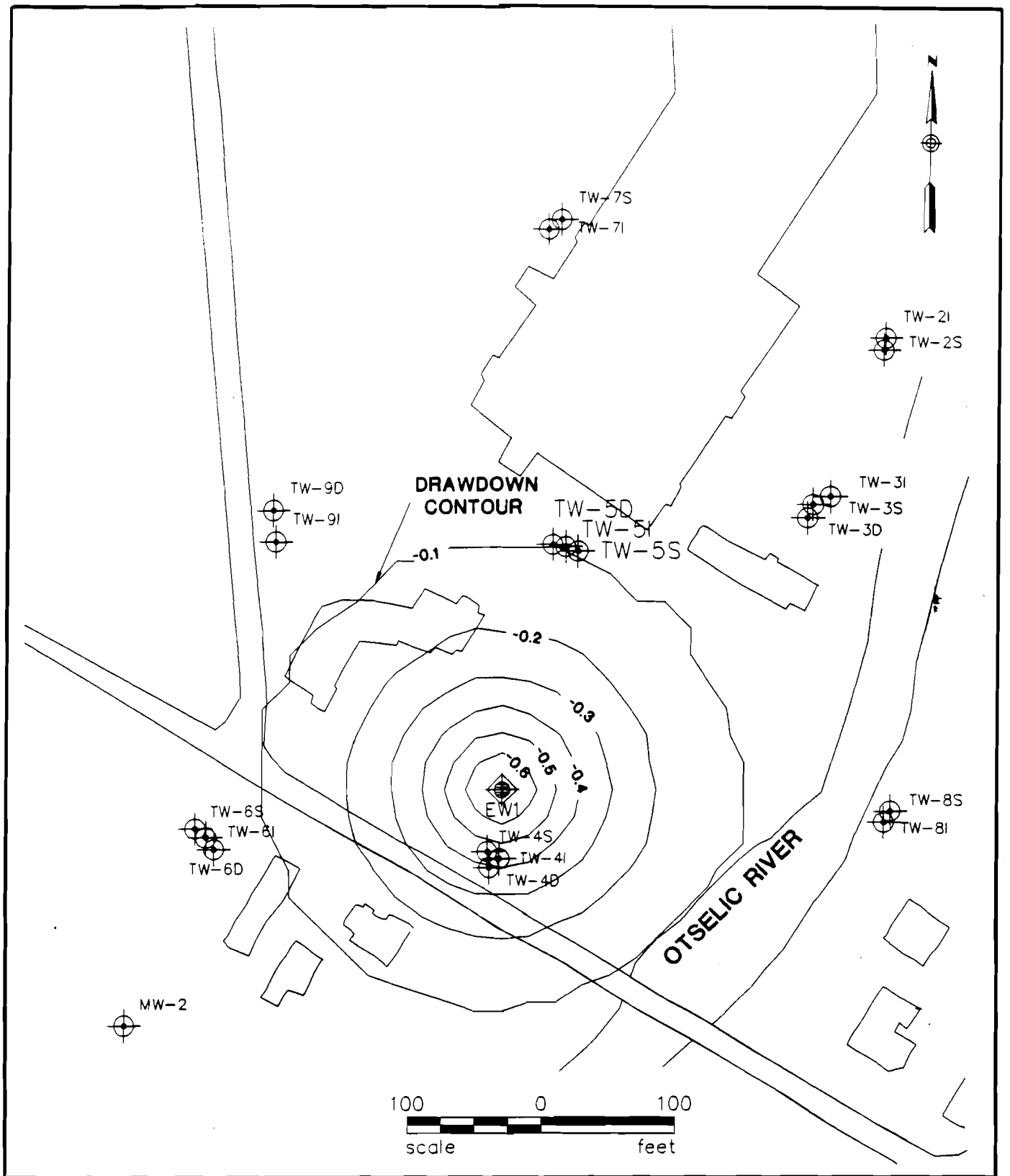
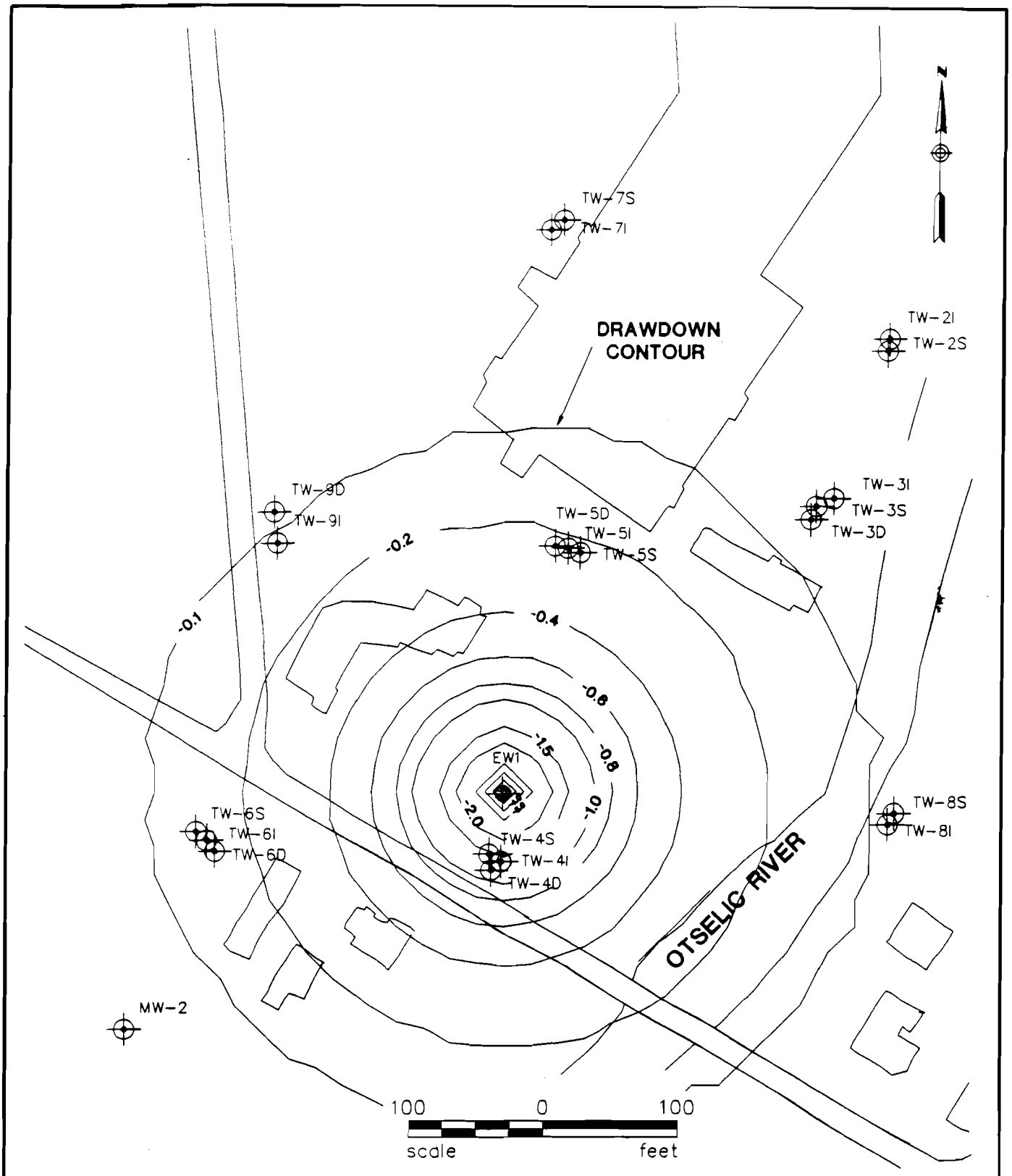
	DRAWN MJ	DATE 3/28/94	
	CHECKED FG	DWG No GL03.DWG	
PREPARED BY RUST ENVIRONMENT & INFRASTRUCTURE	PROJECT GLADDING		FIGURE 3



CLIENT NYSDEC	JOB No 37537.002	SCALE AS SHOWN	SIMULATED DRAWDOWN CONTOURS AFTER 1 DAY OF PUMPING (LAYER 1)
	DRAWN MJ	DATE 3/28/94	
	CHECKED FG	DWG No GL04.DWG	
PREPARED BY RUST ENVIRONMENT & INFRASTRUCTURE	PROJECT GLADDING		FIGURE 4



CLIENT NYSDEC	JOB No 37537.002	SCALE AS SHOWN	SIMULATED DRAWDOWN CONTOURS AFTER 1 DAY OF PUMPING (LAYER 2)
	DRAWN MJ	DATE 3/28/94	
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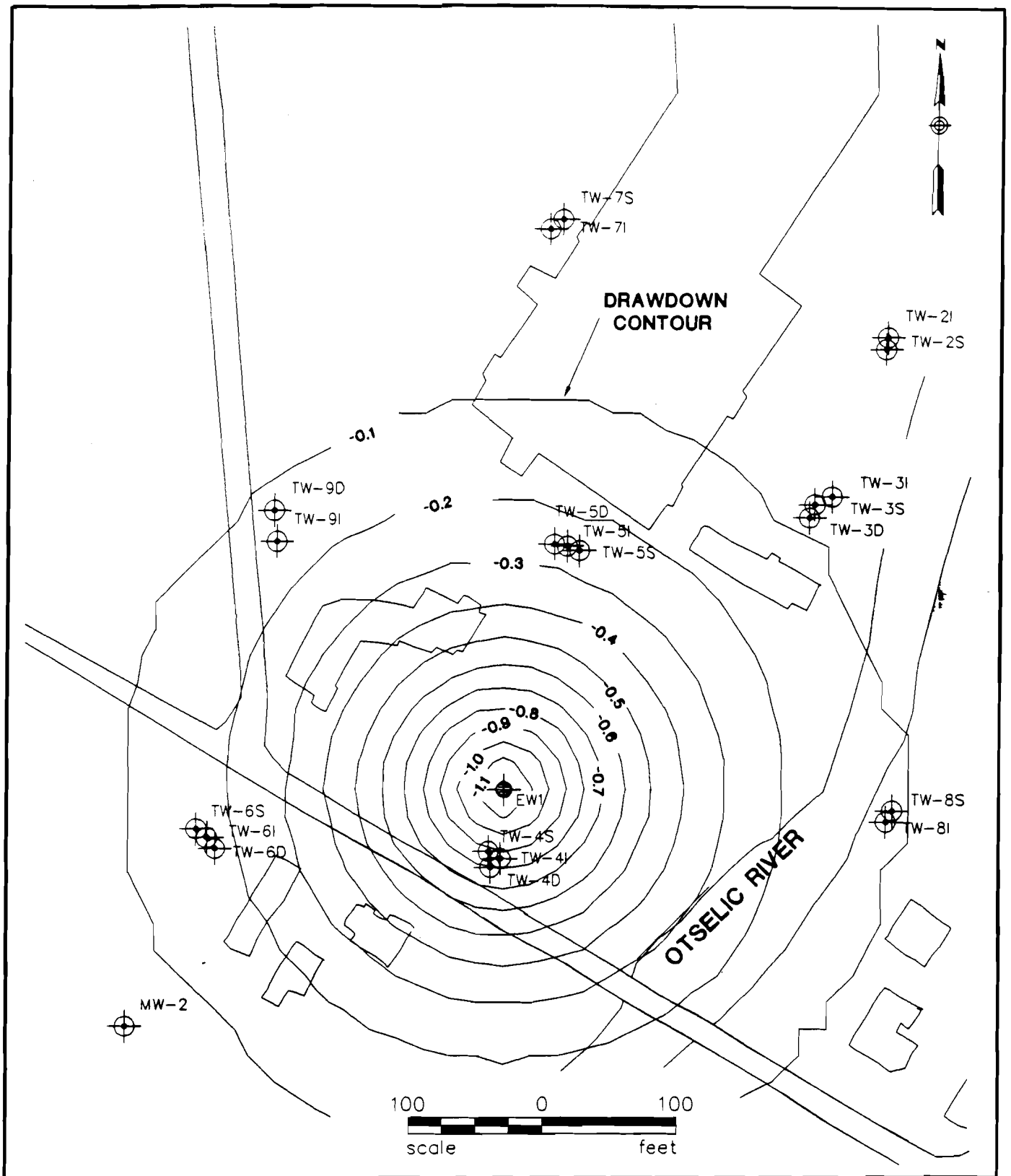
PREPARED BY RUST ENVIRONMENT & INFRASTRUCTURE	PROJECT GLADDING		FIGURE 5



CLIENT NYSDEC	JOB No 37537.002	SCALE AS SHOWN	SIMULATED DRAWDOWN CONTOURS AFTER 1 DAY OF PUMPING (LAYER 3)
	DRAWN MJ	DATE 3/28/94	
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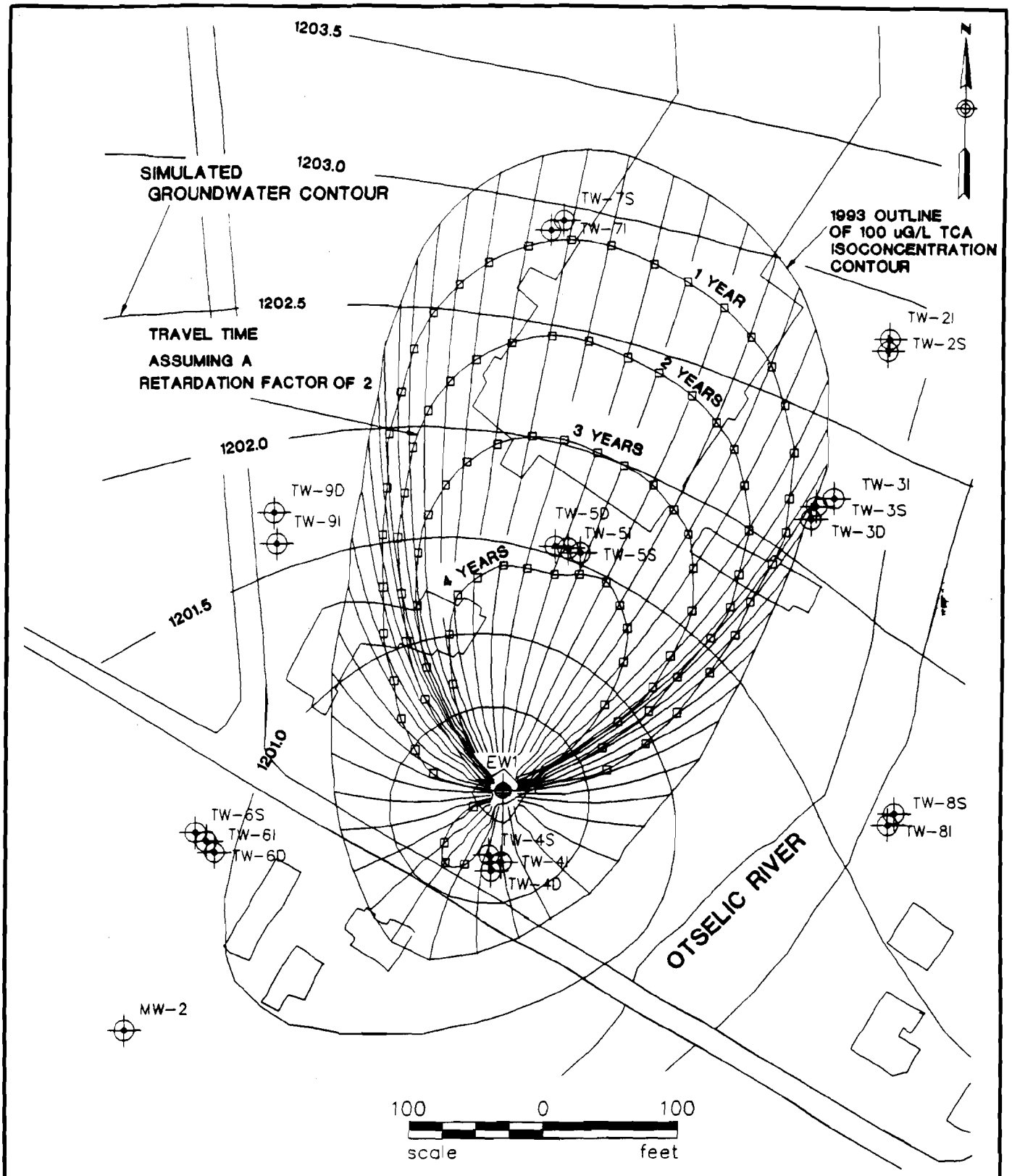
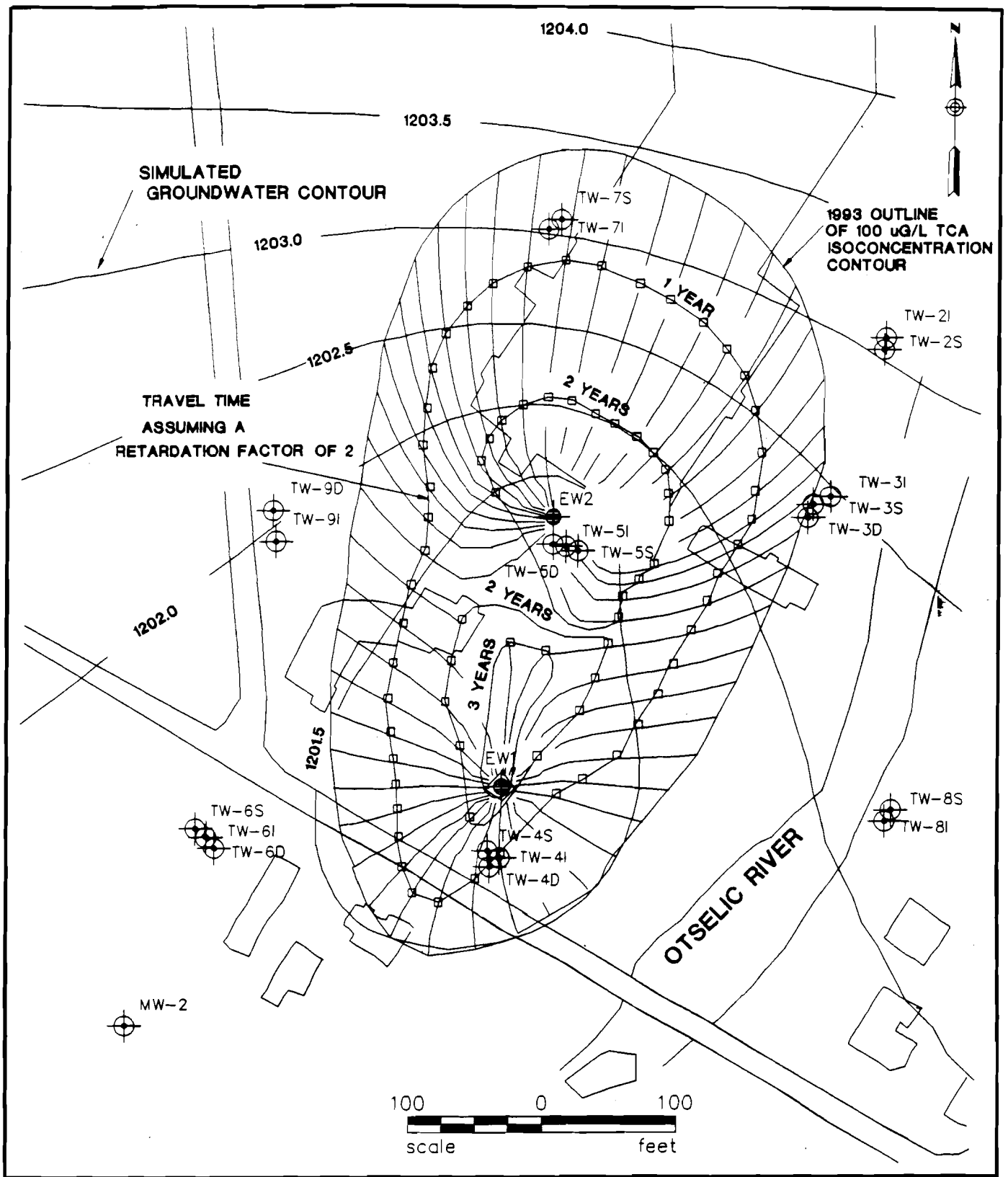
PREPARED BY RUST ENVIRONMENT & INFRASTRUCTURE	PROJECT GLADDING		FIGURE 6



CLIENT	JOB No 37537.002	SCALE AS SHOWN	SCENARIO A STEADY STATE
NYSDEC	DRAWN MJ	DATE 3/28/94	
	CHECKED FG	DWG No GL07.DWG	
PREPARED BY RUST ENVIRONMENT & INFRASTRUCTURE	PROJECT GLADDING		FIGURE 7



CLIENT	JOB No 37537.002	SCALE AS SHOWN	SCENARIO B STEADY STATE
NYSDEC	DRAWN MJ	DATE 3/28/94	
	CHECKED FG	DWG No GL08.DWG	
PREPARED BY RUST ENVIRONMENT & INFRASTRUCTURE	PROJECT GLADDING		FIGURE 8

APPENDIX B

GEOPHYSICAL SURVEY

SPECTRUM NORTH EAST

URBAN GEOPHYSICS ™

GPR
SEISMICS
MAGNETICS
UTILITY LOCATION
ELECTROMAGNETICS

Results of Subsurface Investigation

Gladding Cordage
Gladding Street
South Otselic, New York

Prepared for: **RUST Environmental and Infrastructure**
Albany, New York

Date of Investigation: **June 21, 1994**

Prepared by:

David Bissiri
Office Manager
Spectrum Northeast
P.O. Box 576
Tappan, NY 10983

Contents

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Results of Subsurface Investigation
Gladding Cordage
Gladding Street
South Otselic, New York

Introduction On June 21, 1994 Spectrum Northeast, Inc. conducted a subsurface investigation on a portion of the Gladding Cordage facility located in South Otselic, New York. The purpose was four-fold: 1) investigate eight proposed exploratory boring sites (PEBS); 2) investigate portions of an approximately 100 by 200-foot concrete pad for possible voids/sluice-ways that could interfere with the construction of later structures on top of this concrete pad; 3) delineate detectable utilities along approximately 250 feet of a driveway; and 4) investigate the area in front of the two-story building on Gladdings Street for the possible existence of an underground storage tank (UST).

Methods

The equipment selected for this investigation included a GSSI System-3 ground penetrating radar (GPR) with a 300 MHz transducer and electromagnetic (EM) utility-locating instruments.

GPR data were collected as bidirectional traverses over the following PEBS: TW-7, TW-14, RW-1, and RW-2 and along a proposed trench pathway from the driveway eastward across the concrete pad area toward the Otselic River.

Abundant surface trash and other obstructions, both metallic and non-metallic, prevented the GPR equipment from being operated in a uniform, smooth fashion and hampered the use of some EM equipment. The fudicial marks (vertical dashed lines) on the reprints of the GPR profiles were placed at 5-foot intervals, unless otherwise noted on the profiles.

Results

No unusual buried obstructions to the PEBS were detected. Boring locations were moved only as necessary.

Several metallic conduits of relatively short length were detected, via the EM equipment, on the large concrete pad in the vicinity of the proposed trench . The surface trace of these conduits were painted on the concrtete surface. Their orientation and limited extent are suggestive of rienforcement bars, though their exact source could not be determined.

One area of voids was detected in the concrete slab along GPR traverse A-A'(see plot map and GPR profile A-A'). Subsequent investigation of access plates revealed the existence of a sluice-way.

No UST-like signatures were observed in the GPR data from either the sidewalk/planter area or the grassy area. The depth of GPR penetration was estimated to be 6 feet. GPR data did confirm the presence of a large subsurface object in the grassy area, buried approximately 9 inches deep. However, its expression in the GPR profiles (see profile I-I') and characterization with the EM equipment is more consistent with a tabular object than a UST. The surface trace of this object was delineated using white spray paint and its center marked by a wooden stake and flagging.

APPENDIX C

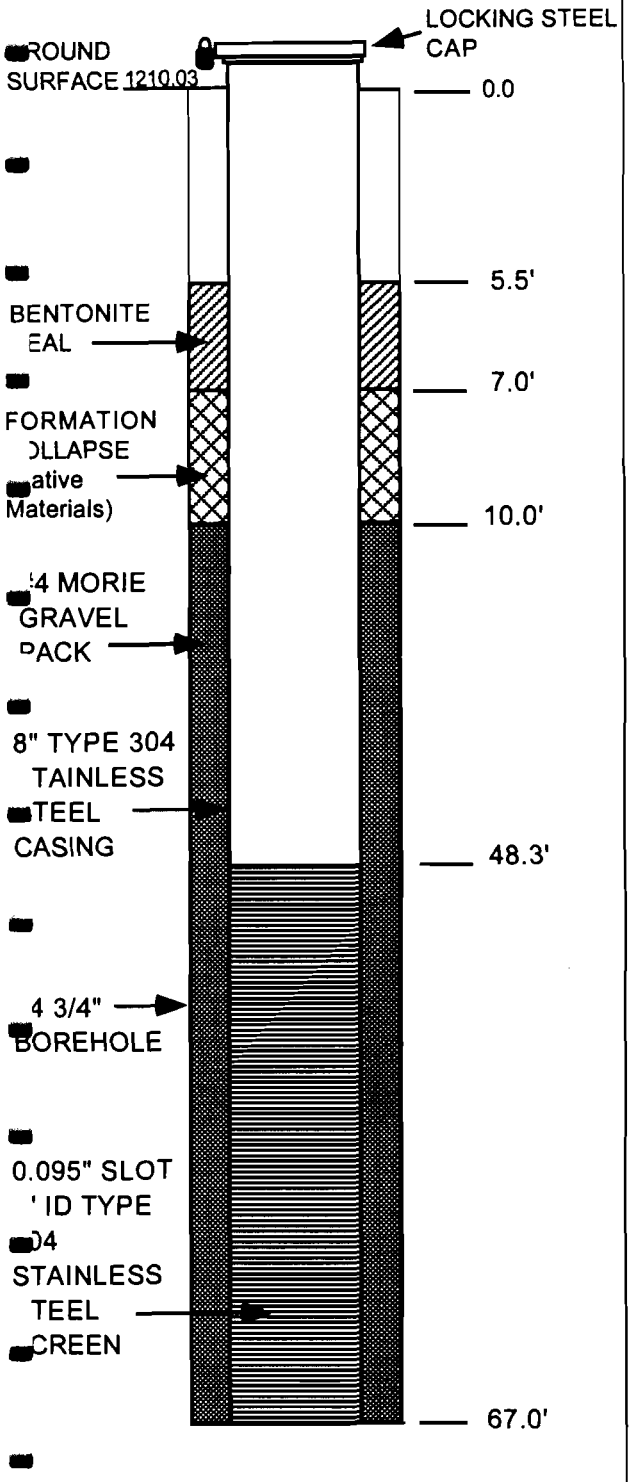
RECOVERY WELL AND MONITORING WELL COMPLETION LOGS

RECOVERY WELL COMPLETION LOG WELL NO. RW-1

Rust Environment & Infrastructure
12 Metro Park Road
Albany, NY 12205
(518) 458-1313

Project Gladding Cordage
Client NYSDEC
Location South Otselic, New York
Project No. 37537.002
Date Drilled 8/8/94-8/13/94
Date Developed 8/13/94-8/23/94

WELL CONSTRUCTION DETAIL



NOT TO SCALE

INSPECTION NOTES

Inspector B. Cooper
Drilling Contractor American Auger

Type of Well Ground Water Recovery
Static Water Level _____ Date _____
Measuring Point (M.P.) _____
Total Depth of Well 67'

Drilling Method
Type Mud Rotary Diameter 14 3/4"
Casing 12" ID Flush Threaded Steel

Sampling Method
Type _____ Diameter _____
Weight _____ Fall _____
Interval Refer to RW-1 Pilot Boring Log

Riser Pipe Left in Place
Material Stainless Steel Diameter 8" ID
Length 49.3' Joint Type Threaded

Screen
Material Stainless Steel Diameter 8"
Slot Size 0.095" Length 18.7
Stratigraphic Unit Screened _____

Filter Pack
Sand X Gravel _____ Natural _____
Grade #4 Morie
Amount 4300 lbs. Interval 5.5'-67.0'

Seal(s)
Type Bentonite Interval 5.5'-7.0'
Type _____ Interval _____
Type _____ Interval _____

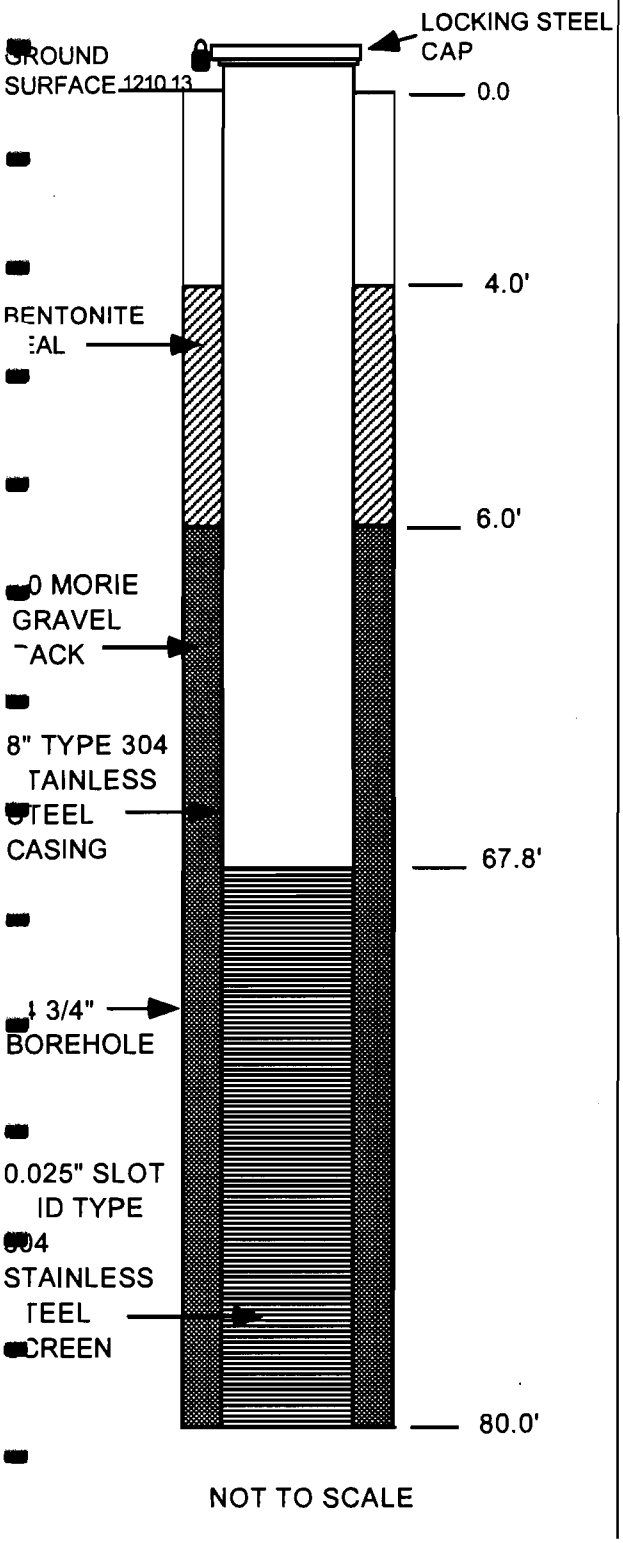
Locking Casing ☒ Yes ☐ No
Notes:

RECOVERY WELL COMPLETION LOG WELL NO. RW-2

Just Environment & Infrastructure
12 Metro Park Road
Albany, NY 12205
(518) 458-1313

Project Gladding Cordage
Client NYSDEC
Location South Otselic, New York
Project No. 37537.002
Date Drilled 8/6/94-8/18/94
Date Developed 8/18/94-8/23/94

WELL CONSTRUCTION DETAIL



NOT TO SCALE

INSPECTION NOTES

Inspector B. Cooper
Drilling Contractor American Auger

Type of Well Ground Water Recovery
Static Water Level _____ Date _____
Measuring Point (M.P.) _____
Total Depth of Well 80'

Drilling Method
Type Mud Rotary Diameter 14 3/4"
Casing 12" ID Flush Threaded Steel

Sampling Method
Type _____ Diameter _____
Weight _____ Fall _____
Interval Refer to RW-2 Pilot Boring Log

Riser Pipe Left in Place
Material Stainless Steel Diameter 8" ID
Length 69.3' Joint Type Threaded

Screen
Material Stainless Steel Diameter 8"
Slot Size 0.025" Length 12.2'
Stratigraphic Unit Screened _____

Filter Pack
Sand X Gravel _____ Natural _____
Grade #0 Morie
Amount 5700 lbs. Interval 6.0'-80.0'

Seal(s)
Type Bentonite Interval 4.0'-6.0'
Type _____ Interval _____
Type _____ Interval _____

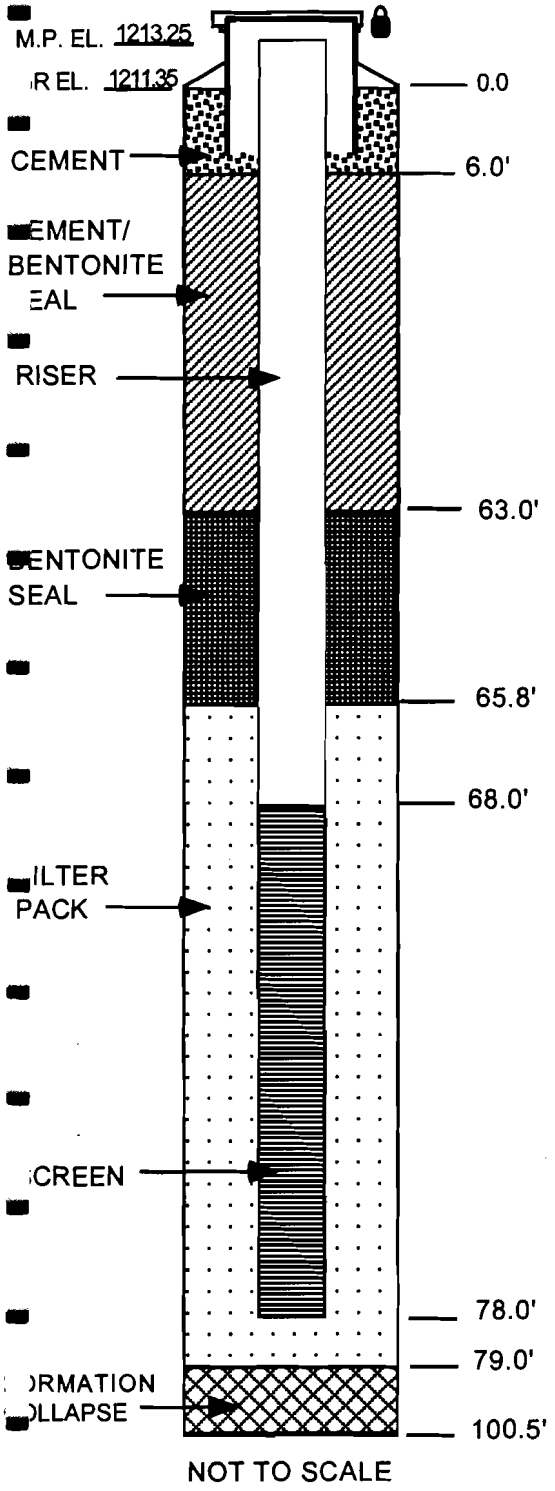
Locking Casing ☒ Yes ☐ No
Notes:

MONITORING WELL COMPLETION LOG WELL NO. TW-7D

Aust Environment & Infrastructure
12 Metro Park Road
Albany, NY 12205
(518) 458-1313

Project Gladding Cordage
Client NYSDEC
Location South Otselic, New York
Project No. 37537.002
Date Drilled 6/21/94-6/22/94
Date Developed 6/28/94 and 7/6/94

WELL CONSTRUCTION DETAIL



NOT TO SCALE

INSPECTION NOTES

Inspector B. Cooper
Drilling Contractor American Auger

Type of Well Environmental Monitoring
Static Water Level 1204.4' Date 8/29/94
Measuring Point (M.P.) Top of Stainless Steel
Total Depth of Well 78.0'

Drilling Method
Type Spin & Wash Diameter 4" ID
Casing Steel, Flush Joint

Sampling Method
Type Split Spoon Diameter 3" OD
Weight 140# Fall 30"
Interval 58'-101.5' (standard sampling)

Riser Pipe Left in Place
Material Type 304 Stainless Steel Diameter 2" ID
Length 70.0' Joint Type Threaded Flush

Screen
Material Type 304 Stainless Steel Diameter 2" ID
Slot Size 0.010" Length 10'
Stratigraphic Unit Screened

Filter Pack
Sand X Gravel Natural
Grade #0 Morie
Amount ~100# Interval 65.8'-79.0'

Seal(s)
Type Bentonite Slurry Interval 63.0'-65.8'
Type Cement/Bentonite Interval 6.0'-63.0'
Type Portland Cement Concrete Interval 0-6.0'

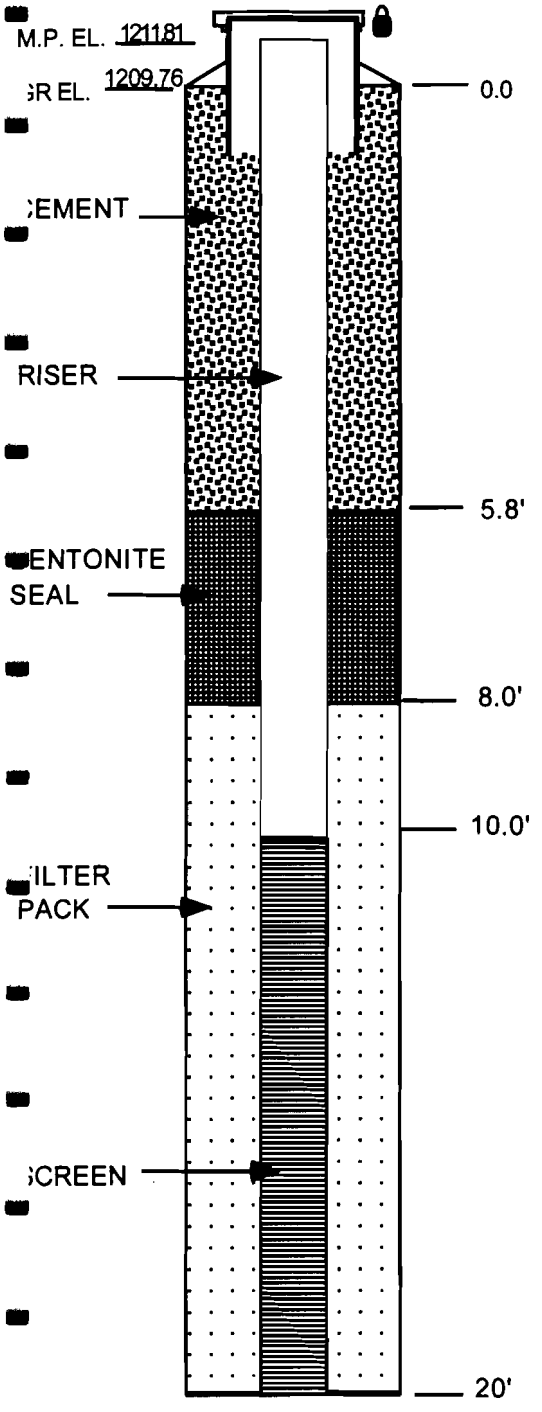
Locking Casing ☒ Yes ☐ No
Notes:

MONITORING WELL COMPLETION LOG WELL NO. TW-14S

Rust Environment & Infrastructure
12 Metro Park Road
Albany, NY 12205
(518) 458-1313

Project Gladding Cordage
Client NYSDEC
Location South Otselic, New York
Project No. 37537.002
Date Drilled 7/6/94
Date Developed 7/7/94 and 7/11/94

WELL CONSTRUCTION DETAIL



NOT TO SCALE

INSPECTION NOTES

Inspector B. Cooper
Drilling Contractor American Auger

Type of Well Observation/Monitoring Well
Static Water Level 1203.69' Date 8/29/94
Measuring Point (M.P.) Top of Stainless Steel
Total Depth of Well 20'

Drilling Method
Type Spin & Wash Diameter 4" ID
Casing Steel

Sampling Method
Type _____ Diameter _____
Weight _____ Fall _____
Interval _____

Riser Pipe Left in Place
Material Type 304 Stainless Steel Diameter 2" ID
Length 12' Joint Type Threaded Flush

Screen
Material Type 304 Stainless Steel Diameter 2" ID
Slot Size 0.010" Length 10'
Stratigraphic Unit Screened _____

Filter Pack
Sand X Gravel _____ Natural _____
Grade #0 Morie
Amount 130# Interval 8'-20'

Seal(s)
Type Bentonite Chips Interval 5.8'-8.0'
Type Portland Cement Concrete Interval 0-5.8'
Type _____ Interval _____

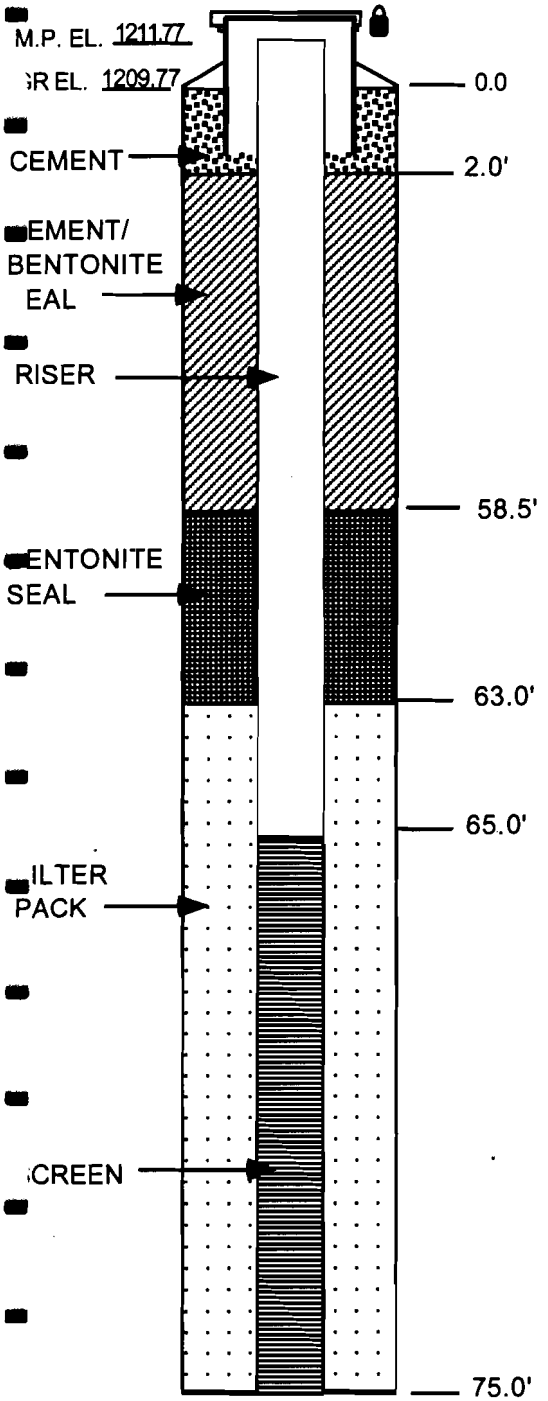
Locking Casing ☒ Yes ☐ No
Notes:
Refer to TW-14D Boring Log for lithologic description.

MONITORING WELL COMPLETION LOG WELL NO. TW-14I

Rust Environment & Infrastructure
12 Metro Park Road
Albany, NY 12205
(518) 458-1313

Project Gladding Cordage
Client NYSDEC
Location South Otselic, New York
Project No. 37537.002
Date Drilled 7/5/94
Date Developed 7/7/94 and 7/11/94

WELL CONSTRUCTION DETAIL



NOT TO SCALE

INSPECTION NOTES

Inspector B. Cooper
Drilling Contractor American Auger

Type of Well Observation/Monitoring Well
Static Water Level 1203.64' Date 8/29/94
Measuring Point (M.P.) Top of Stainless Steel
Total Depth of Well 75'

Drilling Method
Type Spin & Wash Diameter 4" ID
Casing Threaded Flush Joint

Sampling Method
Type _____ Diameter _____
Weight _____ Fall _____
Interval _____

Riser Pipe Left in Place
Material Type 304 Stainless Steel Diameter 2" ID
Length 67' Joint Type Threaded Flush

Screen
Material Type 304 Stainless Steel Diameter 2" ID
Slot Size 0.010" Length 10'
Stratigraphic Unit Screened _____

Filter Pack
Sand X Gravel _____ Natural _____
Grade #0 Morie
Amount 100# Interval 63'-75'

Seal(s)
Type Bentonite Slurry Interval 58.5'-63.0'
Type Cement/Bentonite Interval 2.0'-58.5'
Type Portland Cement Concrete (sand mix) Interval 0-2.0'

Locking Casing ☒ Yes ☐ No

Notes:

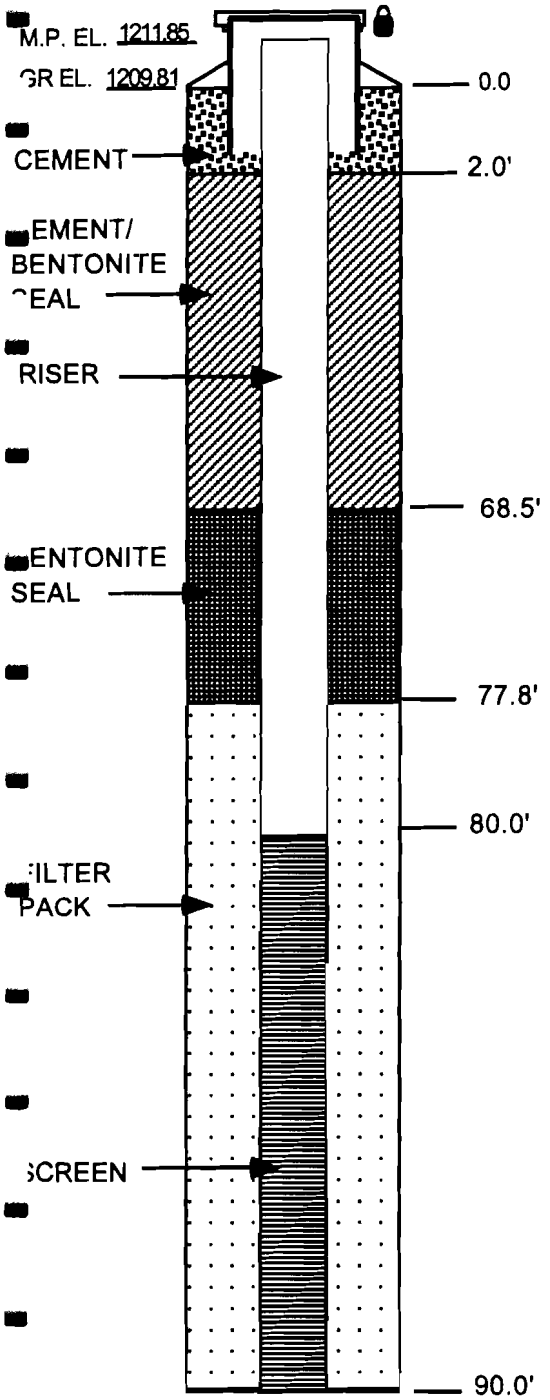
Refer to TW-14D Boring Log for lithologic description.

MONITORING WELL COMPLETION LOG WELL NO. TW-14D

Rust Environment & Infrastructure
12 Metro Park Road
Albany, NY 12205
(518) 458-1313

Project Gladding Cordage
Client NYSDEC
Location South Otselic, New York
Project No. 37537.002
Date Drilled 6/30/94-7/1/94
Date Developed 7/5/94

WELL CONSTRUCTION DETAIL



NOT TO SCALE

INSPECTION NOTES

Inspector B. Cooper
Drilling Contractor American Auger

Type of Well Observation/Monitoring Well
Static Water Level 1203.52' Date 8/29/94
Measuring Point (M.P.)
Total Depth of Well 90'

Drilling Method
Type Spin & Wash Diameter 4" ID
Casing Steel, Flush Joint

Sampling Method
Type Split Spoon Diameter 3" OD
Weight 140# Fall 30"
Interval 4'-91' (standard sampling)

Riser Pipe Left in Place
Material Type 304 Stainless Steel Diameter 2" ID
Length 82' Joint Type

Screen
Material Type 304 Stainless Steel Diameter 2" ID
Slot Size 0.010" Length 10'
Stratigraphic Unit Screened

Filter Pack
Sand X Gravel Natural
Grade #0 Morie
Amount ~95# Interval 77.8'-90.0'

Seal(s)
Type Bentonite Slurry Interval 68.5'-77.8'
Type Cement/Bentonite Interval 2.0'-68.5'
Type Portland Cement Concrete (sand mix) Interval 0-2.0'

Locking Casing ☒ Yes ☐ No

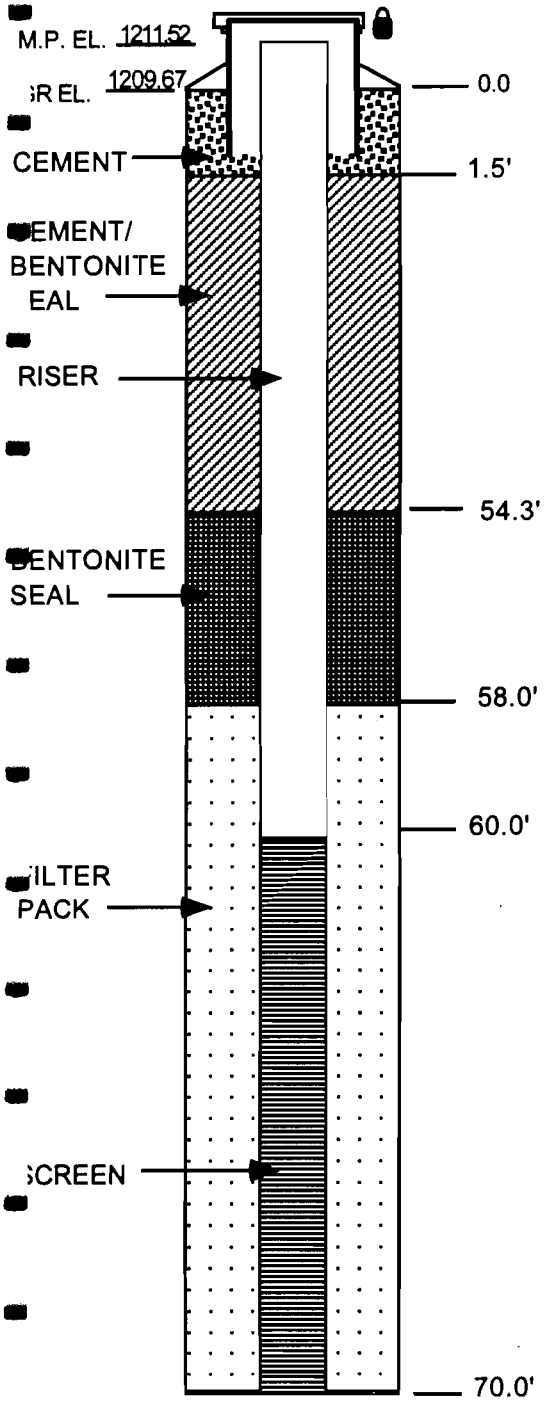
Notes:

MONITORING WELL COMPLETION LOG WELL NO. TW-15I

Rust Environment & Infrastructure
12 Metro Park Road
Albany, NY 12205
(518) 458-1313

Project Gladding Cordage
Client NYSDEC
Location South Otselic, New York
Project No. 37537.002
Date Drilled 6/28/94-6/29/94
Date Developed 7/5/94

WELL CONSTRUCTION DETAIL



NOT TO SCALE

INSPECTION NOTES

Inspector B. Cooper
Drilling Contractor American Auger

Type of Well Observation/Monitoring Well
Static Water Level 1203.64' Date 8/29/94
Measuring Point (M.P.) Top of Stainless Steel
Total Depth of Well 70'

Drilling Method
Type Spin & Wash Diameter 4" ID
Casing Flush Threaded Steel

Sampling Method
Type Split Spoon Diameter 3" OD
Weight 140# Fall 30"
Interval 3'-70' (standard sampling)

Riser Pipe Left in Place
Material Type 304 Stainless Steel Diameter 2" ID
Length 62' Joint Type Threaded Flush

Screen
Material Type 304 Stainless Steel Diameter 2" ID
Slot Size 0.010" Length 10'
Stratigraphic Unit Screened

Filter Pack
Sand X Gravel Natural
Grade #0 Morie
Amount 120# Interval 58'-70'

Seal(s)
Type Bentonite Slurry Interval 54.3'-58.0'
Type Cement/Bentonite Interval 1.5'-54.3'
Type Portland Cement Concrete (sand mix) Interval 0-1.5'
Locking Casing ☒ Yes ☐ No
Notes:

APPENDIX D

WELL DEVELOPMENT RECORDS

WELL DEVELOPMENT LOG

RUST E&I
12 Metro Park Road
Albany, NY 12205
(518) 458-1313

Well I.D.: TW-14S Date: 7/2/04
Project Name: Glenn Springs Landfill
Personnel: B. Cooper
Project No.: 37537.202
Time Start: 12:35 Time Finish: 2:30

WELL INFORMATION:

Screen Diameter (I.D.): 2" Riser Diameter (I.D.): 2"
Screened Interval: 10'-20' Stratigraphic Unit Screened:
Depth to Water: Sand/Silt Accumulation: None
Well Construction Depth: 20' Field Well Depth: 22.74
Well Water Volume: 2.2 gallons Total Volume Removed (gals.): 22 gallons
≈1.9' Stick-up

DEVELOPMENT TECHNIQUE:

Bailer	✓	Bailer Material: Clear PVC Bailer Diameter (I.D.) 1"
Lift Pump		Flow Rate:
Air Lift		Flow Rate:
Submersible		Flow Rate:
Surge		Surge Method: Bail & Jetting
Other		

Well-dedicated Equipment: Yes
Decontamination Procedures:

OBSERVATIONS:

Color	Beginning:	End:
Turbidity	Beginning:	End:
Odor	Beginning:	End:
PH	Beginning:	End:
Temperature.	Beginning:	End:
Conductivity	Beginning:	End:

NOTES:

	1	2	3	4	5	6	7	8	9	10
Color	Med YwBr	Med YwBr	Med YwBr	Med YwBr	Med YwBr	Lt YwBr	Lt YwBr	Lt YwBr	Lt YwBr	Lt YwBr
pH	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8
Spec. Cond. (ms/cm)	0.268	0.273	0.280	0.283	0.280	0.287	0.282	0.286	0.287	0.285
Turbidity (NTUs)	>999	>999	>999	>999	>999	>999	>999	>999	>999	>999
Temperature (°C)	13.7	13.3	12.8	12.8	13.2	12.9	12.7	13.2	13.2	12.9

13.07 Lbs.

WELL DEVELOPMENT LOG

RUST E&I
12 Metro Park Road
Albany, NY 12205
(518) 458-1313

Well I.D.: TW-14S Date: 7/11/94
Project Name: Cadmus Terminal
Personnel: B. Cooper C
Project No.:
Time Start: 12:35 Time Finish: 3:20

WELL INFORMATION:

Screen Diameter (I.D.): 2" Riser Diameter (I.D.): 2"
Screened Intervol: 10'-20' Stratigraphic Unit Screened:
Depth to Water: 8.59' Sand/Silt Accumulation: None
Well Construction Depth: 20' Field Well Depth: 22.05 bmp
Well Water Volume: 22.91 Total Volume Removed (gals.): 24.2 gallons

DEVELOPMENT TECHNIQUE:

Bailer	✓	Bailer Material: Clear PVC Bailer Diameter (I.D.) 1"
Lift Pump		Flow Rate:
Air Lift		Flow Rate:
Submersible		Flow Rate:
Surge		Surge Method: Bailer - Hand
Other		

Well-dedicated Equipment: PVC Bailer
Decontamination Procedures:

OBSERVATIONS:

Color	Beginning:	End:
Turbidity	Beginning:	End:
Odor	Beginning:	End:
PH	Beginning:	End:
Temperature	Beginning:	End:
Conductivity	Beginning:	End:

NOTES: *Ten well volumes previously purged on 7/7/94 (refer to Well Development Record) C

	1	2	3	4	5	6	7	8	9	10	11
Color	Lt YwBr	Lt YwBr	Lt YwBr	Lt YwBr	Lt YwBr	Lt YwBr	Lt YwBr	Lt YwBr	Lt YwBr	Lt YwBr	Lt YwBr
pH	6.5	6.6	6.7	6.7	6.9	6.8	6.7	6.7	6.8	6.75	6.7
Specific Conductivity (mS/cm)	0.285	0.289	0.293	0.294	0.287	0.293	0.293	0.294	0.293	0.294	0.297
Turbidity (NTUs)	>999	>999	>999	>999	993	>999	>999	>999	>999	>999	>999
Temperature (°C)	14.0	12.9	12.6	12.6	11.8	12.6	12.4	12.3	12.1	12.3	12.5

12.55

WELL DEVELOPMENT LOG

RUST E&I
12 Metro Park Road
Albany, NY 12205
(518) 458-1313

Well I.D.: TW-14I Date: 7/7/94
Project Name: Gladding Corridor
Personnel: T. Cook
Project No.: 37537.002
Time Start: 9:30AM Time Finish: 12:05PM

WELL INFORMATION:

Screen Diameter (I.D.): 2" Riser Diameter (I.D.): 2"
Screened Interval: 6'5"-16' Stratigraphic Unit Screened:
Depth to Water: 5.37 Sand/Silt Accumulation: None
Well Construction Depth: 16' Field Well Depth: 16.95 Sump
Well Water Volume: 1½ gallons Total Volume Removed (gals.): 144 gallons
≈18' Sump

DEVELOPMENT TECHNIQUE:

Bailer	☐	Bailer Material: Poly (Waterra) Tubing Bailer Diameter (I.D.) 1/2"
Lift Pump	✓	Flow Rate:
Air Lift	☐	Flow Rate:
Submersible	☐	Flow Rate:
Surge	☐	Surge Method: Waterra Pump
Other	☐	

Well-dedicated Equipment: Waterra Tubing
Decontamination Procedures:

OBSERVATIONS:

Color	Beginning:	End:
Turbidity	Beginning:	End:
Odor	Beginning:	End:
PH	Beginning:	End:
Temperature	Beginning:	End:
Conductivity	Beginning:	End:

NOTES:

	1	2	3	4	5	6	7	8	9	10	11	12	13
Color	Med. Br Gy	Med Br Gy	Med Br Gy	Med Br Gy	Med Br Gy	Lt Gy Br	Lt Gy Br	Med Br Gy	Lt Gy Br	Lt Gy Br	Med Gy Br	Med Gy Br	Med Gy
pH	8.8	8.5	8.3	8.3	8.2	8.2	8.1	8.1	8.1	8.1	7.9	8.0	8.2
Conductivity (ms/cm)	0.209	0.230	0.240	0.251	0.255	0.260	0.263	0.263	0.266	0.268	0.273	0.272	0.27
Turbidity (NTUs)	>999	879	7999	>999	>999	557	427	>999	662	494	7999	>999	>9
Temperature (°C)	15.8	14.7	14.9	13.9	14.6	14.1	14.3	13.7	13.7	13.9	13.6	13.6	13.

WELL DEVELOPMENT LOG

RUST E&I
12 Metro Park Road
Albany, NY 12205
(518) 458-1313

Well I.D.: TW-14I Date: 7/11/94
Project Name: Gladding Breeze
Personnel: B. Cooper
Project No.:
Time Start: 3:50 Time Finish: 5:20

WELL INFORMATION:

Screen Diameter (I.D.): 2" Riser Diameter (I.D.): 2"
Screened Interval: 15'-75' Stratigraphic Unit Screened:
Depth to Water: 8.52' Sand/Silt Accumulation: None
Well Construction Depth: 75' Field Well Depth: 76.05'
Well Water Volume: 11.2 gals Total Volume Removed (gals.): 56 gallons

DEVELOPMENT TECHNIQUE:

Bailer	☐	Bailer Material: _____ Bailer Diameter (I.D.) 1/2"
Lift Pump	☑	Flow Rate: _____
Air Lift	☐	Flow Rate: _____
Submersible	☐	Flow Rate: _____
Surge	☐	Surge Method: Waterra - Hand
Other	☐	

Well-dedicated Equipment: Waterra Tubing
Decontamination Procedures:

OBSERVATIONS:

Color	Beginning:	End:
Turbidity	Beginning:	End:
Odor	Beginning:	End:
PH	Beginning:	End:
Temperature	Beginning:	End:
Conductivity	Beginning:	End:

NOTES: * Thirteen well volumes purged, removed on 7/7/94. See 7/7/94 Well Development Log for details.

	1	2	3	4	5
Color	Med Gy Br	Med Gy Br	Med Gy Br	Med Gy Br	
pH	8.0	8.0	8.1	8.3	
Conductivity (mS/cm)	0.261	0.275	0.266	0.266	
Turbidity (NTU)	>999	>999	>999	>999	LOW BATTERY (HORIBA)
Temperature (°C)	13.5	12.7	12.7	12.8	

12.93

WELL DEVELOPMENT LOG

RUST E&I
12 Metro Park Road
Albany, NY 12205
(518) 458-1313

Well I.D.: TW-14D Date: 7/5/94
Project Name: Gladding Cordage
Personnel: B. Cooper
Project No.: 37537.002
Time Start: 10:50 Time Finish: 2:15

WELL INFORMATION:

Screen Diameter (I.D.): 2" Riser Diameter (I.D.): 2"
Screened Interval: 80-90' Stratigraphic Unit Screened:
Depth to Water: 8.50' bmp Sand/Silt Accumulation: None
Well Construction Depth: 90' Field Well Depth: 92.2' bmp
Well Water Volume: 13.7 gallons Total Volume Removed (gals.): 140

DEVELOPMENT TECHNIQUE:

Bailer	☐	Bailer Material: Poly (Waterra Tubing) Bailer Diameter (I.D.) 1/2"
Lift Pump	✓	Flow Rate: ~1.5 gpm
Air Lift	☐	Flow Rate:
Submersible	☐	Flow Rate:
Surge	☐	Surge Method: Waterra Pump
Other	☐	

Well-dedicated Equipment: Waterra Tubing
Decontamination Procedures:

OBSERVATIONS:

Color	Beginning:	End:
Turbidity	Beginning:	End:
Odor	Beginning:	End:
PH	Beginning:	End:
Temperature	Beginning:	End:
Conductivity	Beginning:	End:

NOTES: After # of Well Volumes Removed

	1	2	3	4	5	6	7	8	9	10
Color	Lt Br	Vry Lt Br	Vry Lt Br	Vry Lt Brn	Vry Lt Gr	Lt Br	Lt Br	Vry Lt Gray	Vy Lt Gr	Vy Lt Gr
pH	7.6	7.6	7.7	7.7	7.7	7.8	7.8	7.8	7.8	7.8
Sp. Cond. (mS/cm)	0.254	0.252	0.253	0.255	0.253	0.255	0.254	0.257	0.259	0.260
Turbidity (NTUs)	135	176	201	81	42	279	413	84	126	84
Temperature (°C)	14.2	14.2	13.7	13.6	14.3	13.7	13.6	13.3	13.5	13.0

13.7

WELL DEVELOPMENT LOG

RUST E&I
12 Metro Park Road
Albany, NY 12205
(518) 458-1313

Well I.D.: TW-7D Date: 6/28/94
Project Name: Gladding Cordage
Personnel: B. Cooper
Project No.:
Time Start: 8:30 Time Finish: 9:40

WELL INFORMATION:

Screen Diameter (I.D.): 2"
Screened Interval: 68'-78'
Depth to Water: 7.26' bmp
Well Construction Depth: 78'±
Well Water Volume: [illegible]
Riser Diameter (I.D.): 2"
Stratigraphic Unit Screened:
Sand/Silt Accumulation:
Field Well Depth: 80.1' bmp (1.8' Stickup)
Total Volume Removed (gals.): 24 (6/28/94)

DEVELOPMENT TECHNIQUE:

Bailer	✓	Bailer Material: [illegible]	Bailer Diameter (I.D.) 1"
Lift Pump		Flow Rate:	
Air Lift		Flow Rate:	
Submersible		Flow Rate:	
Surge		Surge Method:	
Other			

Well-dedicated Equipment: PVC bailer
Decontamination Procedures:

OBSERVATIONS:

	Beginning	End
Color	Med Br	Med Br
Turbidity	>200 NTUs	>200 NTUs
Odor		
PH	6-7	—
Temperature		
Conductivity		

NOTES:

80.1
8
72.1
.163
2.63
3.326
7.21
11.7523

8:30-9:40 Removed [illegible] (12 gallons)
3:35-5:10 " " " " " "
Note: Color Lt Br, ph 6-7, becoming less turbid.

WELL DEVELOPMENT LOG

RUST E&I
12 Metro Park Road
Albany, NY 12205
(518) 458-1313

Well I.D.: TW-7D Date: 7/16/94
Project Name: Glacking Cordage
Personnel: B. Cooper
Project No.: 37537.002
Time Start: 12:20 Time Finish: 2:25

WELL INFORMATION:

Screen Diameter (I.D.): 2" Riser Diameter (I.D.): 2"
Screened Interval: 68'-78' Stratigraphic Unit Screened:
Depth to Water: 8.28 bmp Sand/Silt Accumulation: None
Well Construction Depth: 78' Field Well Depth: 80.1' bmp
Well Water Volume: 2 gallons Total Volume Removed (gals.): 128 gallons

DEVELOPMENT TECHNIQUE:

Bailer	☐	Bailer Material: Poly (Waterra) Tubing Bailer Diameter (I.D.) 1/2"
Lift Pump	☑	Flow Rate: ~1.5gpm
Air Lift	☐	Flow Rate:
Submersible	☐	Flow Rate:
Surge	☐	Surge Method: Waterra Pump
Other	☐	

Well-dedicated Equipment:
Decontamination Procedures:

OBSERVATIONS:

Color	Beginning:	End:
Turbidity	Beginning:	End:
Odor	Beginning:	End:
PH	Beginning:	End:
Temperature	Beginning:	End:
Conductivity	Beginning:	End:

NOTES: Field Parameters after a given number of well volumes have been removed

	1	2	3	4	5	6	7	8	9	10
Color	VyLtBr	VyLt Br	VyLt Br	VyLt Br	VyLt Br	VyLt Br	VyLt Br	—	—	VryLt Br
pH	7.7	7.7	7.7	7.7	7.7	7.7	7.7	7.7	7.7	7.7
Specific Conductance (mS/cm)	0.250	0.268	0.269	0.271	0.273	0.274	0.277	0.271	0.270	0.272
Turbidity (NTUs)	398	408	418	99	101	237	173	102	80	147
Temperature (°C)	12.8	11.9	11.8	12.0	11.7	12.2	11.9	11.7	11.8	12.0

1.28

* Note: 2 well volumes previously purged on 6/28/94.

WELL DEVELOPMENT LOG

RUST E&I
12 Metro Park Road
Albany, NY 12205
(518) 458-1313

Well I.D.: TW-15I Date: 7/5/94
Project Name: Gladding Cordage
Personnel: B Cooper
Project No.: 37537.002
Time Start: 3:30 Time Finish: 5:25

WELL INFORMATION:

Screen Diameter (I.D.): 2" Riser Diameter (I.D.): 2"
Screened Interval: 60'-70' Stratigraphic Unit Screened:
Depth to Water: 8.06' Sand/Silt Accumulation: None
Well Construction Depth: 70' Field Well Depth: 71.98 bmp
Well Water Volume: 10.4 gallons Total Volume Removed (gals.): 105 gallons

DEVELOPMENT TECHNIQUE:

Bailer	☐	Bailer Material: Poly (Waterra) Tubing Bailer Diameter (I.D.) 1/2"
Lift Pump	☑	Flow Rate: ~1.7 gpm
Air Lift	☐	Flow Rate:
Submersible	☐	Flow Rate:
Surge	☐	Surge Method: Waterra Pump
Other	☐	

Well-dedicated Equipment: Waterra Tubing
Decontamination Procedures:

OBSERVATIONS:

Color	Beginning:	End:
Turbidity	Beginning:	End:
Odor	Beginning:	End:
PH	Beginning:	End:
Temperature	Beginning:	End:
Conductivity	Beginning:	End:

NOTES: Field Parameters after a given number of well volumes removed

	1	2	3	4	5	6	7	8	9	10
Color	Med Br	Med Lt Br	Med Lt Br	Med Br	Lt Br	Lt Br	Med Lt Br	Med Lt Br	Lt Br	Lt Br
pH	7.8	7.9	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8
Specific Conductivity (mS/cm)	0.194	0.198	0.196	0.197	0.195	0.194	0.192	0.195	0.195	0.194
Turbidity (UTUs)	>999	548	514	487	473	433	497	437	236	193
Temperature (°C)	12.9	12.5	12.4	12.5	12.3	13.1	13.1	13.0	12.9	12.6

12:12

APPENDIX E

WELL DESIGN CALCULATIONS

RUST ENVIRONMENT & INFRASTRUCTURE

CALCULATION SHEET

PAGE 1 OF 12
PROJECT NO. 37517

CLIENT NYSDEC
PROJECT Gladding

SUBJECT Pumping Well Design

Prepared By MDP Date 7/19/95
Reviewed By JRG Date 7/21/95
Approved By ____ Date ____

TITLE: DESIGN OF RECOVERY WELL RW-1 NEAR MONITORING WELL CLUSTER TW-4 AND RECOVERY WELL RW-2 NEAR MONITORING WELL CLUSTER TW-5

OBJECTIVE: DESIGN EFFICIENT RECOVERY WELLS TO RECOVER 1,1,1-TRICHLOROETHANE (TCA) IN THE INTERMEDIATE AND/OR DEEP PORTIONS OF THE SITE AQUIFER(S)

ASSUMPTIONS:

THE NATURE OF THE UNCONSOLIDATED DEPOSITS AT LOCATIONS RW-1 and RW-2 AS DETERMINED BY PILOT BORINGS.

PILOT BORINGS AT RW-1 AND RW-2 INCLUDED THE RETRIEVAL OF FORMATION SAMPLES UTILIZING A 3-INCH SPLIT-SPOON SAMPLER, AND ARE REPRESENTATIVE OF THE AQUIFER MATERIAL

CHOICE OF FILTER GRAVEL PACK MATERIAL (SIZE, ETC.) WILL BE BASED ON A DESIGN UTILIZING INFORMATION OBTAINED FROM THE GRAIN SIZE DISTRIBUTION CURVES. SCREEN DESIGN (SLOT SIZE ETC.) WILL BE BASED PRIMARILY ON THE GRAVEL PACK MATERIAL CHOSEN FOR DESIGN

PRELIMINARY DESIGN FOR WELLS RW-1 AND RW-2 INCLUDES SCREENED INTERVALS BELOW 50 FT.

RUST ENVIRONMENT & INFRASTRUCTURE

CALCULATION SHEET

PROJECT NO. 37527

CLIENT NYSDEC SUBJECT Pumping Well Design Prepared By MDP Date 7/19/94

PROJECT Gladding Reviewed By JRG Date 7/21/94

Approved By ____ Date ____

METHOD:

SCREEN DIAMETER, LENGTH AND DESIGN WILL BE CHOSEN SO THAT THE AVERAGE ENTRANCE VELOCITY OF WATER ENTERING THE SCREEN AT DESIGN YIELD IS LESS THAN 0.1 FEET PER SECOND

THE SCREEN SLOT SIZE WILL BE DESIGNED TO RETAIN APPROXIMATELY 90 PERCENT OF THE GRAVEL PACK MATERIAL

THE GRAVEL PACK WILL INCREASE THE EFFECTIVE HYDRAULIC RADIUS OF THE WELLS AND STABILIZE THE FORMATION

APPROACH VELOCITY WILL ALSO BE USED AS A DESIGN CRITERIA. THE APPROACH VELOCITY AT DESIGN YIELD WILL BE $V_A < \sqrt{K}/30$ WHERE V_A = APPROACH VELOCITY AND K = HYDRAULIC CONDUCTIVITY

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DESIGN CALCULATIONS: RW-1

RW-1 SOIL SAMPLES

50 - 52'	D_{50} = 6.5 mm	D_{70} = 2.0 mm
52 - 54'	D_{50} = 12.0	D_{70} = 3.3
54 - 56'	D_{50} = 5.2	D_{70} = 1.6
56 - 58'	D_{50} = 5.0	D_{70} = 1.7
58 - 60'	D_{50} = 7.4	D_{70} = 1.7
60 - 62'	D_{50} = 12	D_{70} = 2.4
62 - 64'	D_{50} = 9.0	D_{70} = 2.2
64 - 66'	D_{50} = 25	D_{70} = 16.0
66 - 68'	D_{50} = 2.7	D_{70} = 0.66 ←
68 - 70'	D_{50} = 0.95	D_{70} = 0.22
70 - 72'	D_{50} = <0.75	D_{70} = <0.75
72 - 74'	D_{50} = 0.66	D_{70} = 0.15
74 - 76'	D_{50} = 0.46	D_{70} = 0.08
76 - 78'	D_{50} = 0.83	D_{70} = 0.27
78 - 80'	D_{50} = 0.97	D_{70} = 0.40

BASED ON THE RESULTS OF THE GRAIN SIZE ANALYSIS ABOVE, THE ZONE FROM 66' TO 68' IS SELECTED AS THE SCREENED INTERVAL

THE FILTER GRAVEL PACK DESIGN WILL BE BASED ON THE GRAIN SIZE ANALYSIS OF THE FINEST SAMPLE IN THE SCREENED INTERVAL

THE SAMPLE FROM 66'-68' IS THE FINEST SAMPLE WITHIN THE SCREENED INTERVAL

66'-68' D_{50} = 2.7 mm (50% RETAINED) 0.1063 in. D_{70} = 0.66 mm. (70% RETAINED) 0.0260 in.

BASED PRIMARILY ON THE HETEROGENEOUS NATURE OF TH FORMATION, A GRAVEL PACK RATIO OF 6 IS CHOS

GRAVEL PACK RATIO = 6

66'-68' D_{50} = 2.7mm x 6 = 16.2 mm
0.1063 in. x 6 = 0.6378 in.

D_{70} = 0.66 mm x 6 = 3.96 mm
0.0260 in x 6 = 0.156 in.

A GRAVEL PACK IS CHOSEN THAT HAS A D_{70} (70% RETAINED) VALUE THAT CLOSELY CORRESPONDS TO THE VALUE OF 3.96 mm WHICH REPRESENTS THE D_{70} OF THE SAMPLE X THE 6 GRAVEL PACK RATIO. THIS COMPARISON RESULTS IN A MORIE GRAVEL PACK #4 SELECTION.

THE SCREEN SLOT SIZE NECESSARY TO RETAIN 90% OF THE GRAVEL PACK MATERIAL IS EQUAL TO THE D_{90} RETAINED SIZE OF THE MORIE #4 GRAVEL.

THE D_{90} RETAINED SIZE FOR MORIE #4 GRAVEL IS 0.098 INCHES. A SCREEN SLOT SIZE OF 0.095" WILL BE USED FOR DESIGN PURPOSES TO RETAIN ~90% OF THE GRAVEL PACK AT RW-1.

DESIGN CALCULATIONS: RW-2

RW-2 SOIL SAMPLES

50' - 52'	D_{50} = 0.17 mm	D_{70} = < 0.075 mm
52' - 54'	D_{50} = 0.47	D_{70} = 0.29
54' - 56'	D_{50} = 0.43	D_{70} = 0.26
56' - 58'	D_{50} = 0.13	D_{70} = < 0.075
58' - 60'	D_{50} = 0.17	D_{70} = 0.075
60' - 62'	D_{50} = 0.17	D_{70} = < 0.075
62' - 64'	D_{50} = 0.17	D_{70} = < 0.075
64' - 66'	D_{50} = 0.13	D_{70} = < 0.075
66' - 66.8'	D_{50} = 0.15	D_{70} = < 0.075
66.8' - 68'	D_{50} = 1.7	D_{70} = 0.60
68' - 70'	D_{50} = 4.7	D_{70} = 1.7
70' - 72'	D_{50} = 3.8	D_{70} = 1.4
72' - 74'	D_{50} = 4.5	D_{70} = 1.7
74' - 76'	D_{50} = 4.0	D_{70} = 0.77
76' - 78'	D_{50} = 1.3	D_{70} = 0.16 ←
78' - 80'	D_{50} = 3.8	D_{70} 1.7

BASED ON THE RESULTS OF THE GRAIN SIZE ANALYSIS ABOVE, THE ZONE FROM 68'-80' IS SELECTED AS THE SCREENED INTERVAL

THE FILTER GRAVEL PACK DESIGN WILL BE BASED ON THE GRAIN SIZE ANALYSIS OF THE FINEST SAMPLE IN THE SCREENED INTERVAL

THE SAMPLE FROM 76'-78' IS THE FINEST SAMPLE WITHIN THE SCREENED INTERVAL

76'-78' D_{50} = 1.3 mm (50% RETAINED) 0.0512 in.

D_{70} = 0.16 mm (70% RETAINED) 0.0063 in

BASED PRIMARILY ON THE HETEROGENEOUS NATURE OF THE FORMATION, A GRAVEL PACK RATIO OF 6 IS CHOSEN

GRAVEL PAK RATIO = 6

76'-78' D_{50} = 1.3 mm x 6 = 7.8 mm
0.0512 in x 6 = 0.3072 in

D_{70} = 0.16 mm x 6 = 0.96 mm
0.0063 in x 6 = 0.0378 in.

A GRAVEL PACK IS CHOSEN THAT HAS A D_{70} (70% RETAINED) VALUE THAT CLOSELY CORRESPONDS TO THE VALUE OF 0.96 mm WHICH REPRESENTS THE D_{70} OF THE SAMPLE X THE 6 GRAVEL PACK RATIO. THIS COMPARISON RESULTS IN A MORIE GRAVEL PACK #0 SELECTION

THE SCREEN SLOT SIZE NECESSARY TO RETAIN 90% OF THE GRAVEL PACK MATERIAL IS EQUAL TO THE D_{90} RETAINED SIZE OF THE MORIE #0 GRAVEL

THE D_{90} RETAINED SIZE FOR MORIE #0 GRAVEL IS 0.024 INCHES. A SCREEN SLOT SIZE OF 0.025 INCHES WILL BE USED FOR DESIGN PURPOSES TO RETAIN ~90% OF THE GRAVEL PACK AT RW-2

SCREEN CAPACITY

RW-1 : FOR AN 8-INCH DIAMETER CONTINUOUS SLOT SCREEN, 18 FT AND 0.095 INCH SLOT SIZE

RW-1 ~ (128 in²/ft)(18 ft)(0.31) ≅ 714 GPM CAPACITY, MEETING 0.1 FT/SEC ENTRANCE VELOCITY CRITERIA

RW-2: FOR AN 8-INCH DIAMETER CONTINUOUS SLOT SCREEN, 12 FT. AND 0.025 INCH SLOT SIZE

RW-2 ~ (62 in²/ft)(12 ft.)(0.31) ≅ 230 GPM CAPACITY, MEETING 0.1 FT/SEC ENTRANCE VELOCITY CRITERIA

MAXIMUM TREATMENT SYSTEM CAPACITY HAS BEEN ESTABLISHED AS 150GPM. A 150 GPM MAXIMUM CAPACITY WILL BE USED FOR ENTRANCE VELOCITY CALCULATIONS

RW-1 SURFACE AREA PER 1-FT LENGTH OF SCREEN

$$\text{AREA} = \pi d \cdot 12$$
$$= 3.14 \cdot 8 \text{ in.} \cdot 12 \text{ in}$$
$$= 301.6 \text{ in}^2/\text{ft}$$

TOTAL AREA
$$= 301.6 \text{ in}^2/\text{ft.} \times 18 \text{ ft.}$$
$$= 5{,}428.8 \text{ in}^2$$

% OPEN AREA
$$= \frac{\text{SLOT SIZE}}{\text{SLOT SIZE} \times \text{WIRE WIDTH}} \cdot 100$$
$$= \frac{0.095 \text{ in.}}{0.095 \text{ in.} + 0.091 \text{ in.}} \cdot 100$$
$$= 51.1\%$$

OPEN AREA = SURFACE AREA x % OPEN AREA
= 5,428.8 in² · 0.511 · 1 ft²/144 in²
= 19.3 ft²
PER FT. SCREEN
19.3 ft² ÷ 18 = 1.07 ft²

ENTRANCE VELOCITY (V)
V = Q/A
V = 0.345 ft³/sec / 19.3 ft²
V = 0.017 ft/sec.

Q = 150 gpm
= 0.345 ft³/sec

RW-2 SURFACE AREA PER 1-FT. LENGTH OF SCREEN

AREA = πd · 12
= 3.14 · 8 in. · 12 in
= 301.6 in²/ft.
TOTAL AREA
= 301.6 in²/ft. x 12 ft.
= 3,619.2 in²

% OPEN AREA
= SLOT SIZE / (SLOT SIZE + WIRE WIDTH) · 100
= 0.025 in / (0.025 in. + 0.091 in.) · 100
= 21.6

OPEN AREA = SURFACE AREA X % OPEN AREA
= 3,619.2 in²/ft. · 0.216 · 1 ft²/144 in²
= 5.43 ft²
PER FT. SCREEN
= 5.43 ft² ÷ 12 = 0.45 ft²

ENTRANCE VELOCITY (V)

$V = Q/A$

$V = \frac{0.345\ ft^3/sec}{5.43\ ft^2}$

$V = 0.064\ ft/sec$

$Q = 150\ gpm = 0.345\ ft^3/sec.$

APPROACH VELOCITY

RW-1 ESTIMATION OF THE TOTAL CIRCUMFERENTIAL AREA THROUGH WHICH FLOW OCCURS IS 58.1 FT^2

V_A = APPROACH VELOCITY = RATE / AREA

$= \frac{150\ GPM}{58.1\ FT^2} = \frac{9.46 \times 10^{-3}\ m^3/SEC}{5.40\ m^2}$

$= 0.0018\ m/sec$

$V_A < \sqrt{K}/30$

$0.0018 < 0.0045$ YES

ASSUME HYDRAULIC CONDUCTIVITY OF THE AQUIFER = 0.0006 m/sec.

RW-2 ESTIMATION OF THE TOTAL CIRCUMFERENTIAL AREA THROUGH WHICH FLOW OCCURS IS 39.3 FT^2

V_A = APPROACH VELOCITY = RATE / AREA

$= \frac{150\ GPM}{39.3\ FT^2} = \frac{9.46 \times 10^{-3}\ m^3/sec}{3.65\ m^2}$

$= 0.0026\ m/sec$

RUST ENVIRONMENT & INFRASTRUCTURE

CALCULATION SHEET

PAGE 12 OF 12
PROJECT NO. 37537

CLIENT NYSDEC
PROJECT Gladding

SUBJECT Pumping Well Design

Prepared By MDP Date 7/19/94
Reviewed By JRG Date 7/21/94
Approved By ____ Date ____

$V_A < \sqrt{K}/30$

$0.0026 < 0.0045$ YES

ASSUME HYDRAULIC CONDUCTIVITY OF THE AQUIFER = 0.0006 m/sec

APPENDIX F

BORING LOGS

RUST E&I Albany, NY (518) 458-1313	Test Boring Log	Boring No. RW-1 Pilot Boring
PROJECT: Gladding Cordage		Sheet 1 of 4
CLIENT: NYSDEC		Job No. 37537.002
DRILLING CONTRACTOR: American Auger		Meas. Pt. Elev. NA
PURPOSE: Recovery Well Pilot Boring		Ground Elev. 1210.03

DRILLING METHOD: Spin & Wash		SAMPLE	CORE	CASING	Datum MSL
DRILL RIG TYPE: Mobile B-59	TYPE	Split Spoon		Steel	Date Started: 6/23/94
GROUNDWATER DEPTH:	DIAM.	3" O.D.		4" I.D.	Date Finished: 6/24/94
MEAS. PT.:	WEIGHT	140#			Driller: John Pietruch
DATE OF MEAS.:	FALL	30"			Inspector: B. Cooper

Depth (Feet)	Sample Number	Blow Count	Unified Classif-ication	GRAPHIC LOG	GEOLOGIC DESCRIPTION	REMARKS
					Spin and Wash Drilled to 40' w/ 4"I.D. Flush Joint Casing No samples taken	
10						
20						
30						Lost water at ~ 30'
40						

RUST E&I Albany, NY (518) 458-1313	**Test Boring Log**	**Boring No. RW-1** Pilot Boring
PROJECT: Gladding Cordage		Sheet 2 of 4
CLIENT: NYSDEC		Job No. 37537.002

Depth (Feet)	Sample Number	Blow Counts	Unified Classif-ication	Visual Log Description	Geologic Description	Remarks
40	S-1	14 10 9 11			BrGr c(+)mfS, l(-)m(+)fG, t$; angular to subangular G	Rec = 1.1' Wet HNU Bkgd = 0.2 ppm Spoon = Bkgd Head Space = Bkgd
42	S-2	12 14 16 16			GrBr cmf(+)G a(+),c(+)mfS, t(+)$ &C; subangular to subrounded G	Rec = 1.1' Wet HNU Spoon = Bkgd Head Space = 0.6 ppm
44	S-3	15 23 27 27			Gr cm(+)fG a(-),c(+)mS; subangular - subrounded;occ. rd SS.	Rec = 0.9' Wet HNU Spoon = Bkgd Head Space = 0.8 ppm
46	S-4	20 15 20 35			BrGr cmf(+)G s,c(+)mfS, t(-)$; subrounded to subangular G	Rec = 0.9' Wet HNU Bkgd = 0.4 ppm Spoon = Bkgd Head Space = Bkgd
48	S-5	38 40 25 28			BrGr cmfG l(+),cmfS, t(-)$ 49' ±	Rec = 0.9' Wet HNU Spoon = Bkgd
50	S-6	33 26 30 36			Br c(+)mfG l(+),cmfS, t(+)$ & C, freq cbl fgmts. 50' ±	Head Space = 0.3 ppm
52	S-7	28 36 25 36			GrBr cmf(+)G s,c(+)mfS, t $ &C; angular to subrounded;lower 0.3' similar to material at 49-50'	Rec = 1.6' Wet HNU Bkgd = 0.6 ppm Spoon = Bkgd Head Space = 0.3 ppm
54	S-8	28 27			Br&Gr cmfG s(+),cmfS, t(+)$ & C; Gr toward bottom Do. (Gr & Br) (OUTWASH)	Rec = 0.6' Wet HNU Spoon = Bkgd Head Space = 0.6 ppm Rec = 1.3' Wet

RUST E&I Albany, NY (518) 458-1313	**Test Boring Log**	**Boring No. RW-1** Pilot Boring
PROJECT: Gladding Cordage		Sheet 3 of 4
CLIENT: NYSDEC		Job No. 37537.002

Depth (Feet)	Sample Number	Blow Counts	Unified Classif-ication	Visual Log Description	Geologic Description	Remarks
	S-8 (cont.)	28				
56		37				
	S-9	43			Do.	Rec = 1.6' Wet HNU Spoon = Bkgd Head Space = 0.1 ppm
		40				
		40				
58		58				
	S-10	39			Do.	Rec = 0.9' Wet HNU Spoon = Bkgd Head Space = 0.5 ppm
		40				
		45				
60		40				
	S-11	29			GrBr cmf(+)G a(-),c(+)mfS, l (+)Cy $; angular to subrounded.	Rec = 1.0' Wet HNU Spoon = Bkgd Head Space = 0.7 ppm
		61				
		65				
62		49				
	S-12	38			GrBr cmf(+)G s(+),c(+)mfS, tCy$; dns lyr approx. 0.5' thick.	Rec = 1.3' Wet HNU Spoon = Bkgd Head Space = NA (Low Battery)
		42				
		42				
64		28				
	S-13	32			Gr cmfG l(+)S l(-)$ &C; cbl fgmts; large ls rk fgmt	Rec = 0.3' Wet HNU: NA (Low Battery)
		45				
		54				
66		100			66.0'	
	S-14	33			Dk Gr cm(+)fS, t(-)fG 66.7'	
		43			BrGr cmf(+)G s(-),c(+)mfS, t$; wea R cbl frag.	Rec = 1.5' Wet HNU: NA
		77				
68		–			68.0'	
	S-15	25			Gr cmfS, lmfG, t$ 68.5'	Rec = 1.3' Wet HNU
		63			Gr cmfS, s(+)c(+)mfG, t$	
		61				
70		28			69.8' Gr$; homogeneous (~0.2' thick)	

RUST E&I Albany, NY (518) 458-1313	**Test Boring Log**	**Boring No. RW-1** Pilot Boring
PROJECT: Gladding Cordage		Sheet 4 of 4
CLIENT: NYSDEC		Job No. 37537.002

Depth (Feet)	Sample Number	Blow Counts	Unified Classif-ication	Visual Log Description	Geologic Description	Remarks
70	S-16	23 20 24 35			Gr$, lfS; lyrd; homogeneous; freq. fS seam in lower 0.2';rd. fG at base. 72'	Rec = 1.5' Wet
72	S-17	12 23 27 35			Gr m(+)fG a(+), cmfS, t$ 73' Gr cmfS, t$, t(-)mfG;$ & vfS in seams and lyrd.	Rec = 1.5' Wet
74	S-18	17 29 30 27			74.7' Gr&Brc(+)mfS, afG, $; $ seams at base near bottom.	Rec = 1.6' Wet
76	S-19	16 28 61 55			Do. 76.7' GrBr cmfG a,c(+)mfS, tCy$; cbls. 78'	Rec = 1.6' Wet
78	S-20	20 24 22 25			BrGr c(+)mfS, t(-)$, a(+)mf(+)G 79.7'	Rec = 1.6' Wet
80	S-21	15 20 58 50			Br cmfS, t$, t(+)fG 80.3' Br fS, s$ 81.3' GrBr c(+)mfS, amf(+)G 82'	Rec = 2.0' Wet
82	S-22	31 42 40 40			BrGr G l(+),cmfS, tC; cbl frags. 82.7' GrBr cm(+)fG s(+),cmfS, t(+)$ & C; cbl frags. 84'	Rec = 1.1' Wet
84					End of Boring Total Depth = 84'	

RUST E&I Albany, NY (518) 458-1313	Test Boring Log	Boring No. RW-2 Pilot Boring
PROJECT: Gladding Cordage		Sheet 1 of 4
CLIENT: NYSDEC		Job No. 37537.002
DRILLING CONTRACTOR: American Auger		Meas. Pt. Elev. NA
PURPOSE: Recovery Well Pilot Boring		Ground Elev. 1210.13

DRILLING METHOD: Spin & Wash		SAMPLE	CORE	CASING	Datum MSL
DRILL RIG TYPE: Mobile B-59	TYPE	Split Spoon			Date Started: 6/27/94
GROUNDWATER DEPTH:	DIAM.	3" O.D.		4" I.D.	Date Finished: 6/28/94
MEAS. PT.:	WEIGHT	140 #			Driller: J. Pietruch
DATE OF MEAS.:	FALL	30"			Inspector: B. Cooper

Depth (Feet)	Sample Number	Blow Count	Unified Classif-ication	GRAPHIC LOG	GEOLOGIC DESCRIPTION	REMARKS
					Spin and wash drilled to 46.0' w/ 4" I.D. Flush Joint Spin Casing No samples taken.	
10						
20						
30					Lost water at 30.5' ± Regained water at 32' ± Lost water at 34' ±	
40						

RUST E&I Albany, NY (518) 458-1313	**Test Boring Log**	**Boring No. RW-2** Pilot Boring
PROJECT: Gladding Cordage		Sheet 2 of 4
CLIENT: NYSDEC		Job No. 37537.002

Depth (Feet)	Sample Number	Blow Counts	Unified Classif-ication	Visual Log Description	Geologic Description	Remarks
46						
		7			GrBr mfS, s(+)$; occ. mS lyrs. and sms; angled bedding.	Rec = 1.7' Wet HNU Bkgd = 0 Spoon = Bkgd Head Space = 0.4 ppm
	S-1	8				
		10				
		13				
48						
		11			Dk Gr Br cmf(+)S, t(+)$, lmfG; G rded. occurs in upper portion of interval; freq. mS seams	Rec = 1.5' Wet HNU Spoon = Bkgd Head Space = 0.6 ppm
	S-2	10				
		9				
		12				
50						
		8			Dk Gr Br mf(+)S, t$; angled bedding	Rec = 2.0' Wet HNU Spoon = Bkgd Head Space = 0.6 ppm
	S-3	9				
		14				
		17				
52						
		9			Dr Gr Br cmfS, t(-)$, tmfG; G rded.	Rec = 2.0' Wet HNU Bkgd = 0.2 ppm Spoon = Bkgd Head Space = 0.4 ppm
	S-4	14				
		19				
		24				
54						
		13			Dk Gr Br cm(+)fS, t(-)$, t(-)G; cross-bedded	Rec = 2.0' Wet HNU Spoon = Bkgd Head Space = 0.3 ppm
	S-5	10				
		14				
		19				
56						
		10			Gr Br to Dk Gr Br mf(+)S, t(+)$; $ seams in middle & bottom of interval; coarsens upward.	Rec = 2.0' Wet HNU Spoon = Bkgd Head Space = 0.3 ppm
	S-6	17				
		18				
		23				
58						
		12			Do. w/ $ seams at top.	Rec = 2.0' Wet HNU Spoon = Bkgd Head Space = Bkgd
	S-7	24				
		23				
		29			(OUTWASH)	
60						

RUST E&I Albany, NY (518) 458-1313	**Test Boring Log**	**Boring No. RW-2** Pilot Boring
PROJECT: Gladding Cordage		Sheet 3 of 4
CLIENT: NYSDEC		Job No. 37537.002

Depth (Feet)	Sample Number	Blow Counts	Unified Classif-ication	Visual Log Description	Geologic Description	Remarks
60	S-8	10			GrBr mf(+)S, l(-)$; homogeneous.	Rec = 1.9' Wet HNU Bkgd = 0.2 ppm Spoon = Bkgd Head Space = Bkgd
		16				
		23				
62		30				
	S-9	13				Rec = 2.0' Wet HNU Spoon = Bkgd Head Space = Bkgd
		15			Do. 63.2'	
		30			Dk GrBr cm(+)fS s, $, l(+)mf(+)G; isolated mG at base	
64		18			64.3'	
	S-10	7				Rec = 1.7' Wet HNU Spoon = Bkgd Head Space = Bkgd
		11			GrBr mf(+)S, l(-)$, occ. rded. mG frags.	
		13				
66		19				
	S-11	8				Rec = 1.9' Wet HNU Spoon = Bkgd Head Space = 0.2 ppm
		16			66.8'	
		23			GrBr c(+)mfS, t(-)$, a(+)cmf(+)G.	
		32			68.0'	
68	S-12	33				Rec = 1.2' Wet HNU Bkgd = 0.2 ppm Spoon = Bkgd Head Space = Bkgd
		27			GrBr cmf(+)G s, c(+)mfS, t(-)$; subangular G.	
		30				
70		39				
	S-13	18				Rec = 0.8' Wet HNU Spoon = Bkgd Head Space = Bkgd
		21			GrBr cmf(+)G a, c(+)mfS, t$ & C; subangular to subrounded G.	
		48				
72		33				
	S-14	14				Rec = 1.2' Wet HNU Spoon = Bkgd Head Space = Bkgd
		21			Do.	
		26				
74		30				
	S-15	24				Rec. = 1.2' Wet
		24			Do. (OUTWASH)	

RUST E&I Albany, NY (518) 458-1313	**Test Boring Log**	**Boring No. RW-2** Pilot Boring
PROJECT: Gladding Cordage		Sheet 4 of 4
CLIENT: NYSDEC		Job No. 37537.002

Depth (Feet)	Sample Number	Blow Counts	Unified Classif-ication	Visual Log Description	Geologic Description	Remarks
	S-15 (cont)	33			75.6'	HNU Spoon = Bkgd Head Space = Bkgd
		21			GrBr fS, l$, $ seams at bottom.	
76					76.5'	Rec = 1.3' Wet HNU Spoon = Bkgd Head Space = Bkgd
	S-16	19			BrGr mf(+)G s, c(+)mfS, t(-)$; subrounded G.	
		16				
		30				
		33				
78	S-17	40			GrBr cmf(+)G a(+), c(+)mfS, t$ &C; dense.	Rec = 0.9' Wet HNU Spoon = Bkgd Head Space = Bkgd
		39				
		33				
80		42			(OUTWASH) 80.0'	
					End of Boring Total Depth = 80.0'	

RUST E&I Albany, NY (518) 458-1313	Test Boring Log				Boring No. TW-7D
PROJECT: Gladding Cordage					Sheet 1 of 5
CLIENT: NYSDEC					Job No. 37537.002
DRILLING CONTRACTOR: American Auger					Meas. Pt. Elev. 1213.25
PURPOSE: Environmental Monitoring					Ground Elev. 1211.35
DRILLING METHOD: Spin & Wash		SAMPLE	CORE	CASING	Datum MSL
DRILL RIG TYPE: Mobile B-59	TYPE	Split Spoon		Steel	Date Started: 6/21/94
GROUNDWATER DEPTH:	DIAM.	3" O.D.		4" I.D.	Date Finished: 6/22/94
MEAS. PT.:	WEIGHT	140#			Driller: John Pietruch
DATE OF MEAS.:	FALL	30"			Inspector: B. Cooper

Depth (Feet)	Sample Number	Blow Count	Unified Classif-ication	GRAPHIC LOG	GEOLOGIC DESCRIPTION	REMARKS
50					Spin and wash drilled to 58.0' with 4" ID steel spin casing. No samples taken, no cutting returns. Refer to TW-7I Boring Log for lithologic details.	

RUST E&I Albany, NY (518) 458-1313	Test Boring Log	Boring No. TW-7D
PROJECT: Gladding Cordage		Sheet 2 of 5
CLIENT: NYSDEC		Job No. 37537.002

Depth (Feet)	Sample Number	Blow Counts	Unified Classif-ication	Visual Log Description	Geologic Description	Remarks
50						
55						
58	S-1	13 14 22 23			BrGr c(+)mfS, t(-)Cy $, a(-)cmfG; sl odr; subangular to subrounded G and cS.	Rec = 1.8' Wet HNU Bkgd = 0.2 ppm Spoon = 5-15 ppm Head Space = 2.6 ppm NOTE: Lost drilling return water at 60' ±.
60						
63	S-2	20 25 31 35			BrGr c(+)mfS, t(-)Cy $, lcmfG; very faint odr.	Rec = 1.9' Wet HNU Spoon = 1 ppm Head Space = 3.2 ppm
65					(TILL)	

RUST E&I Albany, NY (518) 458-1313	**Test Boring Log**	**Boring No. TW-7D**
PROJECT: Gladding Cordage		Sheet 3 of 5
CLIENT: NYSDEC		Job No. 37537.002

Depth (Feet)	Sample Number	Blow Counts	Unified Classif-ication	Visual Log Description	Geologic Description	Remarks
65						
68	S-3	24 32 32 36			BrGr cm(+)fG a(-), c(+)mfS, t(-)Cy $; subangular to subrounded G.	Rec = 1.4' Wet HNU Spoon = Bkgd Head Space = 0.7 ppm
70						Hit hard material at ~ 71'
73	S-4	23 29 65 50/0.33			BrGr c(+)mfS, a(+)mf(+)G, t$ & C; occ. lyrs or lenses of Sy C & $.	Rec = 1.2' Wet HNU Spoon = 1.8 ppm Head Space = 1.1 ppm
75						
78	S-5	24 29 34 34			BrGr cmfG l(+), cmfS, tC & $; dense, occ. wea G, (TILL)	Rec = 1.4' Wet HNU Spoon = Bkgd Head Space = 0.8 ppm

RUST E&I Albany, NY (518) 458-1313	Test Boring Log	Boring No. TW-7D
PROJECT: Gladding Cordage		Sheet 4 of 5
CLIENT: NYSDEC		Job No. 37537.002

Depth (Feet)	Sample Number	Blow Counts	Unified Classif-ication	Visual Log Description	Geologic Description	Remarks
80						
83	S-6	21 30 39 60			GrBr mf(+)S, l(-)$; coarsens, upward; (84.6-85.0); fS with vertical infilling of mS; dense.	Rec = 2.0' Wet HNU Spoon = Bkgd Head Space = 0.9 ppm
85						
88	S-7	13 23 29 55			GrBr mf(+)S, l(-)$; homogeneous; coarser zone near top.	Rec = 2.0' Wet HNU Spoon = Bkgd Head Space = 1.2 ppm
90						
93	S-8	14 45 43 63			GrBr mf(+)S, t$ & C, lm(+)fG; dense	Rec = 1.6' Wet HNU Spoon = Bkgd Head Space = 1.0 ppm
95						

RUST E&I Albany, NY (518) 458-1313	Test Boring Log	Boring No. TW-7D
PROJECT: Gladding Cordage		Sheet 5 of 5
CLIENT: NYSDEC		Job No. 37537.002

Depth (Feet)	Sample Number	Blow Counts	Unified Classif-ication	Visual Log Description	Geologic Description	Remarks
95						
98	S-9	22 48 50/0.1'			Gr fS, s(-)$, homogeneous (mostly vfS)	Rec = 0.9' Wet HNU Spoon = Bkgd Head Space = Bkgd
100					100.5'	Rec. = 0'
	S-10	50/0			End of Boring Total Depth = 100.5'	Spoon Refusal at 100.5'

RUST E&I Albany, NY (518) 458-1313	Test Boring Log	Boring No. TW-14D
PROJECT: Gladding Cordage		Sheet 1 of 7
CLIENT: NYSDEC		Job No. 37537.002
DRILLING CONTRACTOR: American Auger		Meas. Pt. Elev. 1211.85
PURPOSE: Observation Well		Ground Elev. 1209.81

		SAMPLE	CORE	CASING	
DRILLING METHOD: Spin & Wash					Datum MSL
DRILL RIG TYPE: Mobile B-59	TYPE	Split Spoon		Steel	Date Started: 6/30/94
GROUNDWATER DEPTH:	DIAM.	3" O.D.		4" I.D.	Date Finished: 7/1/94
MEAS. PT.:	WEIGHT	140#			Driller: John Pietruch
DATE OF MEAS.:	FALL	30"			Inspector: B. Cooper

Depth (Feet)	Sample Number	Blow Count	Unified Classif-ication	GRAPHIC LOG	GEOLOGIC DESCRIPTION	REMARKS
4	S-1	13 14 17 14				Rec = 0'
6	S-2	7 16 21 17			Br mf(+)G t(+), c(+)mfS	Rec = 0.15' Wet HNU Bkgd = 0.2 ppm Spoon = Bkgd Head Space = Bkgd
9	S-3	16 18			Br cm(+)fG s, cmf(+)S, t(+)$ & C, cbl frags. (OUTWASH)	Rec = 0.9' Wet HNU

RUST E&I Albany, NY (518) 458-1313	**Test Boring Log**	**Boring No. TW-14D**
PROJECT: Gladding Cordage		Sheet 2 of 7
CLIENT: NYSDEC		Job No. 37537.002

Depth (Feet)	Sample Number	Blow Counts	Unified Classif-ication	Visual Log Description	Geologic Description	Remarks
10	S-3 (cont)	48				Spoon = Bkgd Head Space = 0.2 ppm
		38				
11						
14	S-4	38			Br & Gr c(+)mfG s(-), c(+)mfS, t$ & C; angular Gr & rk (cbl) fgmts; dense (becoming somewhat less dense toward bottom).	Rec = 1.3' Wet HNU Spoon = Bkgd Head Space = Bkgd
		39				
		68				
		52				
16						
19	S-5	35			Br & Gr cm(+)fG s(-), c(+)mfS, t$ & C, looser than material at 14' - 16'.	Rec = 1.3' Wet HNU Spoon = Bkgd Head Space = Bkgd
		52				
		48				
		70				
21						
					22.5' ±	
24	S-6	14			Dk Gr Br to lt. Gr Br mf(+)S, l(-) $; coarsens upward;	Rec = 1.3' Wet
		8				

RUST E&I Albany, NY (518) 458-1313	Test Boring Log	Boring No. TW-14D
PROJECT: Gladding Cordage		Sheet 3 of 7
CLIENT: NYSDEC		Job No. 37537.002

Depth (Feet)	Sample Number	Blow Counts	Unified Classif-ication	Visual Log Description	Geologic Description	Remarks
	S-6 (cont)	18			Occ. mS ptgs & freq. $ ptgs in lower zone; crossbedded	HNU Spoon = NA Head Space = 0.2 ppm (Moisture problems w/ HNU)
26		23				
29						
	S-7	16			Br & Gr cm(-)fG s(+), c(+)mfS, t(-) $; freq. stnd. reddish orange.	Rec = 1.3' Wet HNU Spoon = Bkgd Head Space = 0.2 ppm
		13				
		23				
		35				
31						
						Lost water at ~ 32'
34						
	S-8	19			Br & Gr cm(+)fG t(+), c(+)mfS; minor silt (<1%); subangular to subrounded G.	Rec = 0.8' Wet HNU Spoon = Bkgd Head Space = 0.2 ppm
		24				
		28				
		32				
36						
39						
	S-9	28			Br & Gr c(+)mfG, t(+)c(+)mfS, t(-) Cy $; c G is mostly cbl frags.;	Rec = 0.8' Wet
		32				

RUST E&I Albany, NY (518) 458-1313	Test Boring Log	Boring No. TW-14D
PROJECT: Gladding Cordage		Sheet 4 of 7
CLIENT: NYSDEC		Job No. 37537.002

Depth (Feet)	Sample Number	Blow Counts	Unified Classif-ication	Visual Log Description	Geologic Description	Remarks
	S-9 (cont)	35			subangular to subrounded mfG	HNU Spoon = Bkgd Head Space = 0.2 ppm
		33				
41						
44	S-10	35			Gr c(-)mfG l, cS; clean, large cbl fgmt. in drive shoe.	Rec = 0.4' Wet HNU Spoon = 0.1 ppm Head Space = 0.3 ppm
		29				
		32				
46		33				
49	S-11	20			BrGr cmfG l, c(+)mfS, t(-)$; angular to subrounded G; occ. cbls.	Rec = 0.7' Wet HNU Spoon = Bkgd Head Space = Bkgd
		20				
		30				
51		21				
54	S-12	20			BrGr c(+)mfG l(-), c(+)mfS, t(-)$, occ. cbl frag.; subangular to subrounded	Rec = 0.6' Wet HNU
		22				

RUST E&I Albany, NY (518) 458-1313	Test Boring Log	Boring No. TW-14D
PROJECT: Gladding Cordage		Sheet 5 of 7
CLIENT: NYSDEC		Job No. 37537.002

Depth (Feet)	Sample Number	Blow Counts	Unified Classif-ication	Visual Log Description	Geologic Description	Remarks
55	S-12 (cont)	42				Spoon = Bkgd Head Space = 0.2 ppm
		58				
56						
59	S-13	19			Gr & Br c(+)mfG l(+), cm(+)fS, t(-)$, more dense w/ $yS matrix, freq. cbl. fgmts.	Rec = 0.9' Wet HNU Spoon = Bkgd Head Space = 0.4 ppm
		21				
		27				
		33				
61						
64	S-14	38			Br Gr c(+)mfG l(-), c(+)mfS, t(-)Cy $; freq. cbl. frags.; subangular to subrounded G.	Rec = 0.75' Wet HNU Spoon = Bkgd Head Space = 0.2 ppm
		42				
		37				
		27				
66						
69	S-15	26			Gr & Yw Gr cm G; cbl. fgmts.	Rec = 0.6' Wet
		33			69.5 ±	

RUST E&I Albany, NY (518) 458-1313	Test Boring Log	Boring No. TW-14D
PROJECT: Gladding Cordage		Sheet 6 of 7
CLIENT: NYSDEC		Job No. 37537.002

Depth (Feet)	Sample Number	Blow Counts	Unified Classif-ication	Visual Log Description	Geologic Description	Remarks
70	S-15 (cont)	28			Gr mf(+)G a(+), fS, s(-)$; subrounded G.	HNU Spoon = Bkgd Head Space = 0.4 ppm
		29				
71						
74	S-16	29			Gr c(+)mfG t(+), cmfS, t(-)$; cG includes cbl frags.	Rec = 0.8' Wet HNU Spoon = Bkgd Head Space = 0.2 ppm
		28				
		30				
		32				
76						
79	S-17	20			BrGr mf(+)G s(-), c(+)mfS, t(-)$; subangular to subrounded G; cbls.	Rec = 0.45' Wet HNU Spoon = Bkgd Head Space = 0.1 ppm
		32				
		59				
		70				
81						
84	S-18	22			GrBr c(+)mfG a, c(+)mfS, t(-)$; isolated cbl. frag.; angular to subrounded G.	Rec = 1.1' Wet
		32				

RUST E&I Albany, NY (518) 458-1313	Test Boring Log	Boring No. TW-14D
PROJECT: Gladding Cordage		Sheet 7 of 7
CLIENT: NYSDEC		Job No. 37537.002

Depth (Feet)	Sample Number	Blow Counts	Unified Classif-ication	Visual Log Description	Geologic Description	Remarks
85	S-18 (cont)	48				HNU Spoon = Bkgd Head Space = 0.2 ppm
		44				
86						
89	S-19	19			Dk BrGr cmf(-)S, t(-)$, tfG; coarsens upward; subangular to subrounded G.	Rec = 1.1' Wet HNU Spoon = Bkgd Head Space = 0.3 ppm
		21				
		19				
		29			91.0'	
91					End of Boring Total Depth = 91.0'	see well construction detail TW-14D for well installation information

RUST E&I Albany, NY (518) 458-1313	**Test Boring Log**	**Boring No. TW-15I**
PROJECT: Gladding Cordage		Sheet 1 of 5
CLIENT: NYSDEC		Job No. 37537.002
DRILLING CONTRACTOR: American Auger & Ditching, Inc.		Meas. Pt. Elev. 1211.52
PURPOSE: Observation Well		Ground Elev. 1209.67

		SAMPLE	CORE	CASING	
DRILLING METHOD: Spin & Wash					Datum MSL
DRILL RIG TYPE: Mobile B-59	TYPE	Split Spoon		Steel	Date Started: 6/28/94
GROUNDWATER DEPTH:	DIAM.	3" O.D.		4" I.D.	Date Finished: 6/29/94
MEAS. PT.:	WEIGHT	140#			Driller: John Pietruch
DATE OF MEAS.:	FALL	30"			Inspector: B. Cooper

Depth (Feet)	Sample Number	Blow Count	Unified Classif-ication	GRAPHIC LOG	GEOLOGIC DESCRIPTION	REMARKS
4	S-1	5 9 30 22			Br cmfS, a(+)$ & C, smfG, angular G.	Rec = 0.8' Wet HNU Bkgd = 0 Spoon = Bkgd Head Space = Bkgd
9	S-2	27 45			Br & Gr cmfG s, c(+)mfS, t$ & C; freq. cbl. frags.	Rec = 0.9' Wet HNU Spoon = Bkgd Head Space = Bkgd

RUST E&I Albany, NY (518) 458-1313	**Test Boring Log**	**Boring No. TW-15I**
PROJECT: Gladding Cordage		Sheet 2 of 5
CLIENT: NYSDEC		Job No. 37537.002

Depth (Feet)	Sample Number	Blow Counts	Unified Classif-ication	Visual Log Description	Geologic Description	Remarks
11	S-2 (cont)	75 49				
12						
13						
14						
15	S-3	35 34 35 45			Gr & Br cmf(+)G s, c(+)mfS, t(-)$; subangular to subrounded G.	Rec = 1.2' Wet HNU Spoon = Bkgd Head Space = 0.2 ppm
16						
17						
18						
19						Lost water at 19'
20	S-4	20 18 19 21			Gr cmf(+)G, s(+), c(+)mS, clean, isolated Cy & zone (matrix material) at bottom; subangular to subrounded G.	Rec = 1.4' Wet HNU Spoon = Bkgd Head Space = Bkgd
21						
22						
23						
24						
	S-5	14 21			GrBr cm(+)fG s, c(+)mfS, t(+) Cy $	Rec = 0.9' Wet

RUST E&I Albany, NY (518) 458-1313	Test Boring Log	Boring No. TW-15I
PROJECT: Gladding Cordage		Sheet 3 of 5
CLIENT: NYSDEC		Job No. 37537.002

Depth (Feet)	Sample Number	Blow Counts	Unified Classif-ication	Visual Log Description	Geologic Description	Remarks
25	S-5 (cont)	41			freq. Cy $, sfS lyr (0.1')	HNU Spoon = Bkgd Head Space = Bkgd Return water came back at 25'
26		23				
27					27.5' ±	
28						
29						
30	S-6	9 16 25			Dk Gr Br cmf(-)S, t(-)$, lmfG; subrounded mG; ls&qtz. rk frag.	Rec = 1.2' Wet HNU Spoon = Bkgd Head Space = 0.2 ppm
31		18				
32						
33						
34						
35	S-7	14 16 16			Dk Br Gr c(+)mfS, t(-)$, a(+)m(+)fG; clean; subrounded G.	Rec = 1.4' Wet HNU Bkgd = 0.1 ppm Spoon = Bkgd Head Space = Bkgd
36		16				
37						
38						
39						
	S-8	18 22			Gr Br c(-)mfG s(-), c(+)mfS, t(-)$, subangular to subrounded G.	Rec = 1.3' Wet

RUST E&I Albany, NY (518) 458-1313	**Test Boring Log**	**Boring No. TW-15I**
PROJECT: Gladding Cordage		Sheet 4 of 5
CLIENT: NYSDEC		Job No. 37537.002

Depth (Feet)	Sample Number	Blow Counts	Unified Classif-ication	Visual Log Description	Geologic Description	Remarks
40	S-8 (cont)	22				HNU Spoon = Bkgd Head Space = Bkgd
		23				
41						
44	S-9	18			Br Gr cmf(+)G s(+), c(+)mfS, t(-)$; freq. cbl. fgmts; angular to subrounded G.	Rec = 1.1' Wet HNU Spoon = Bkgd Head Space = Bkgd
		20				
		23				
		18				
46						
49	S-10	12			Gr mfG a(+), fS, t$, subrounded G; red SS.	
		11			49.6' ±	Rec = 1.5' Wet HNU Spoon = Bkgd Head Space = 0.2 ppm
		8			Gr fS, s$; homogeneous; vfS with occ. fS ptgs.	
		8				
51						Coarse gravel (large red & white pebbles are quartzite)
54	S-11	28			GrBr fS, l$, s(-)mfG.	Rec = 0.1' Reattempt same interval
		21				

RUST E&I Albany, NY (518) 458-1313	Test Boring Log	Boring No. TW-15I
PROJECT: Gladding Cordage		Sheet 5 of 5
CLIENT: NYSDEC		Job No. 37537.002

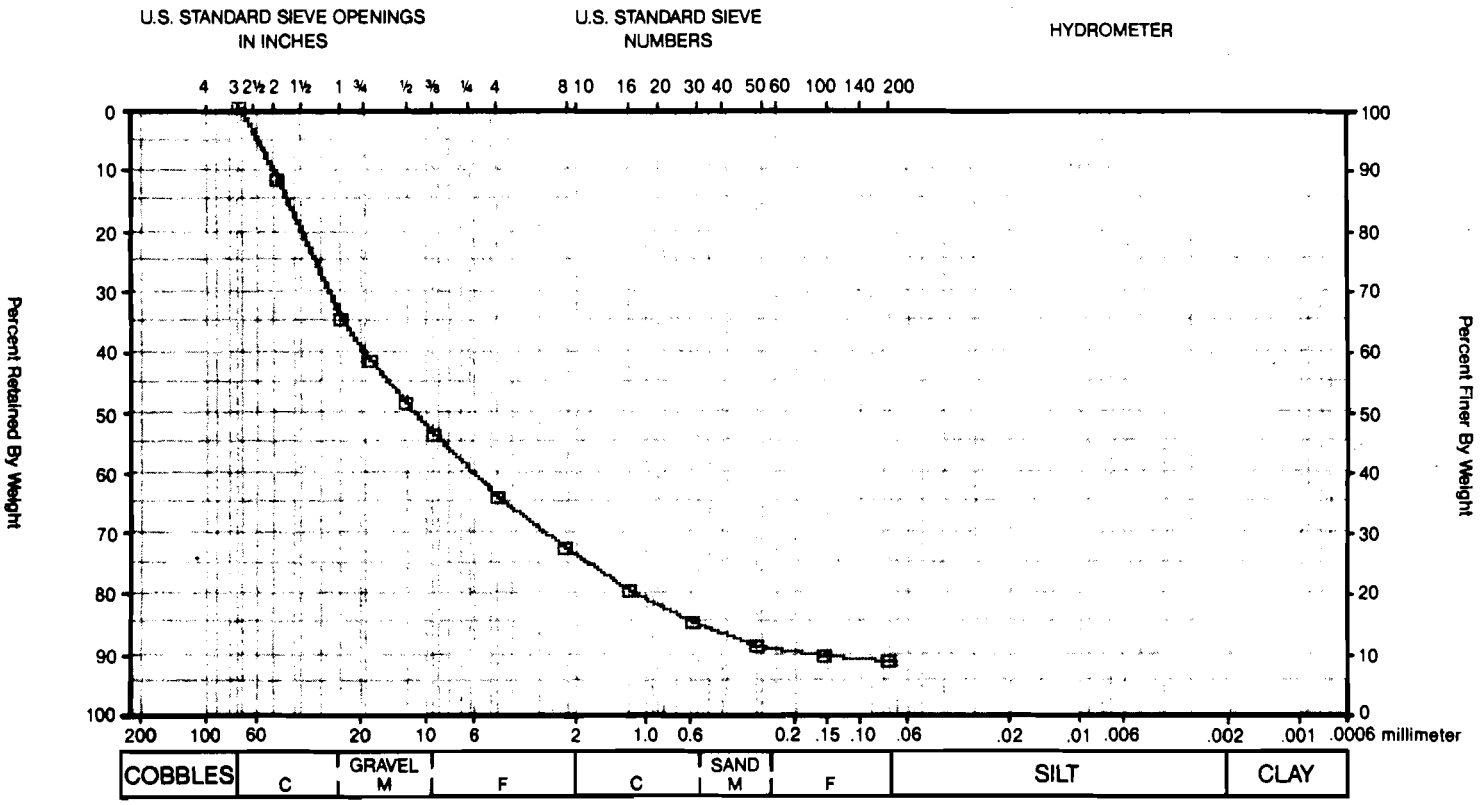
Depth (Feet)	Sample Number	Blow Counts	Unified Classif-ication	Visual Log Description	Geologic Description	Remarks
	S-11 (cont)	18			55.0' ±	Rec = 1.5'
		9			Br fS, s(-)$	Wet
56						HNU
						Spoon = Bkgd
						Head Space = 0.2 ppm
59						
	S-12	22			Br Gr cmf(+)G s(-), c(+)mS, t(-)$;	Rec = 1.1'
		18			silty matrix zone at top;	Wet
		12			subrounded G; isolated ls cbl	HNU
		18			piece.	Spoon = Bkgd
61						Head Space = 0.1 ppm
64					Gr Br mf(+)G s, c(+)mfS, t$	
		25				Rec = 1.2'
					64.7' ±	Wet
	S-13	15				HNU
		15			Dk Gr Br cmf(-)S, t(-)$	Spoon = Bkgd
		17				Head Space = 0.5 ppm
66						
					67.0 ±	
68						
		16			Gr Br cmfS, t$, amf(+)G.	Rec = 1.4'
	S-14	21				Wet
69						HNU
		17			70.0' ±	Spoon = Bkgd
		19			End of Boring	Head Space = Bkgd
70					Total Depth = 70.0'	

APPENDIX G

GRADATION ANALYSES

CLIENT: NYS DEC, GLADDING CORDAGE SITE
LAB NUMBER: 7-94-22/37537.002 DATE RECEIVED: 7/6/94
TEST BY: REF DATE TESTED: 7/8/94
REVIEWED BY: WSC DATE REPORTED: 7/12/94
SAMPLE DESCR: RW-1, S-5, 48-50 feet

GRAIN SIZE DISTRIBUTION



COARSE

SIZE (inches)	PERCENT RETAINED	CUMULATIVE PERCENT PASSING	SPECS.
3	0.00	100.00	
2	11.80	88.20	
1	23.31	64.89	
3/4	7.10	57.79	
1/2	7.08	50.70	
3/8	5.25	45.46	

FINE

SIEVE	PERCENT RETAINED	CUMULATIVE PERCENT PASSING	SPECS.
4	10.40	35.05	
8	8.21	26.84	
16	7.12	19.73	
30	5.37	14.35	
50	4.07	10.28	
100	1.78	8.50	
200	1.09	7.41	

HYDROMETER

PARTICLE DIAMETER (mm)	PERCENT PASSING	SPECS.

Pan = 7.41%
Wash Loss Was Not Tested.

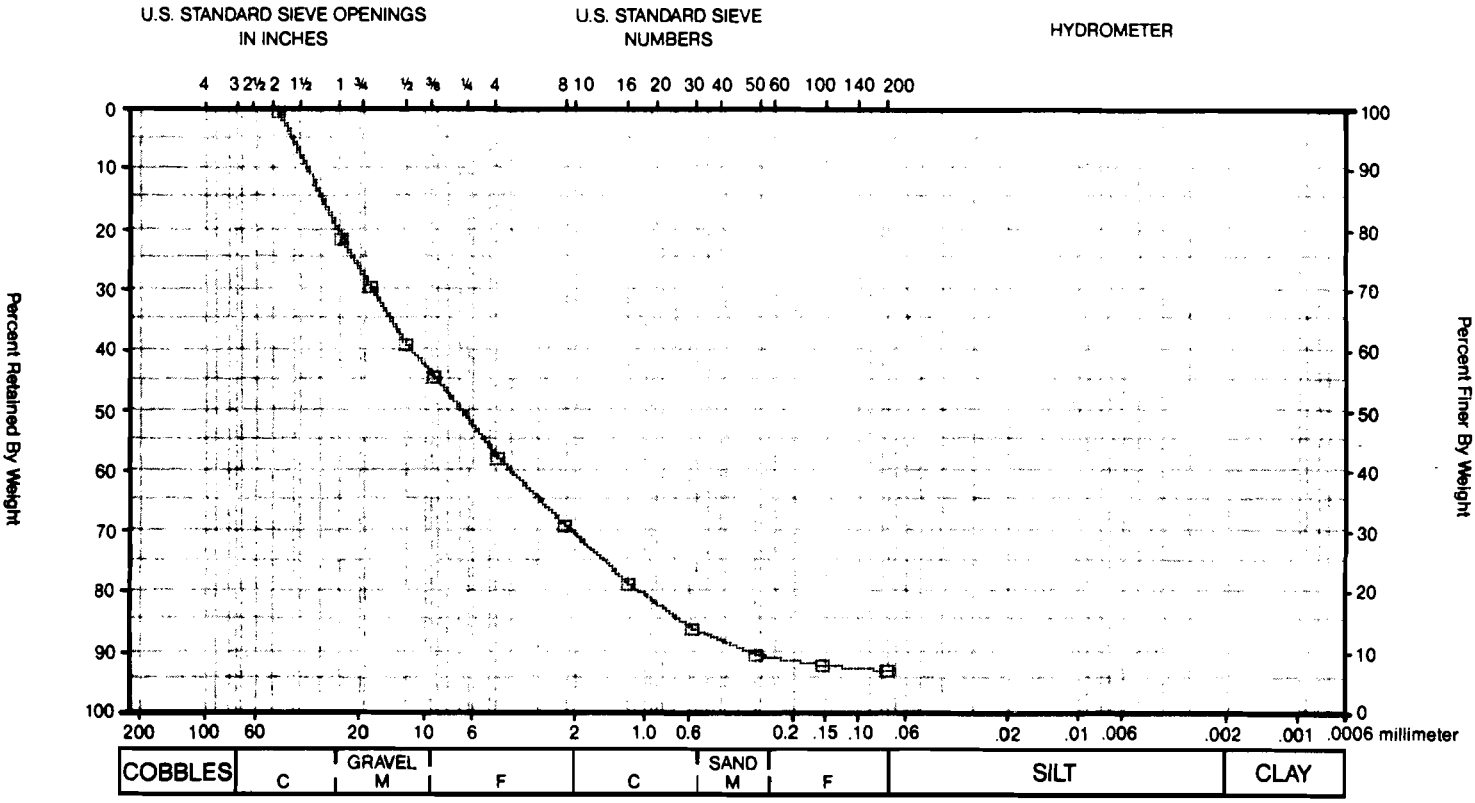
SPECIFICATION: ASTM C 136
TEST STANDARD:
NOTES: ALL SAMPLES WERE TAKEN FROM A 3 inch O.D. SPLIT SPOON

Test Samples are retained for 30 days after submission and then discarded, unless other arrangements are made.

J6

CLIENT: NYS DEC, GLADDING CORDAGE SITE
LAB NUMBER: 6-94-60/37537.002 DATE RECEIVED: 6/29/94
TEST BY: KASJ DATE TESTED: 6/30/94
REVIEWED BY: WSC DATE REPORTED: 7/6/94
SAMPLE DESCR: RW-1, S-6, 50-52 feet

GRAIN SIZE DISTRIBUTION



COARSE

SIZE (inches)	PERCENT RETAINED	CUMULATIVE PERCENT PASSING	SPECS.
2	0.00	100.00	
1	20.73	79.27	
3/4	8.34	70.93	
1/2	9.39	61.53	
3/8	5.54	55.99	

FINE

SIEVE	PERCENT RETAINED	CUMULATIVE PERCENT PASSING	SPECS.
4	13.27	42.72	
8	11.12	31.60	
16	10.04	21.56	
30	7.23	14.34	
50	4.38	9.96	
100	1.86	8.09	
200	1.02	7.08	

HYDROMETER

PARTICLE DIAMETER (mm)	PERCENT PASSING	SPECS.

Pan = 7.08%
Wash Loss Was Not Tested.

SPECIFICATION: ASTM C 136
TEST STANDARD:
NOTES: ALL SAMPLES WERE TAKEN FROM A 3 inch O.D. SPLIT SPOON

Test Samples are retained for 30 days after submission and then discarded, unless other arrangements are made.

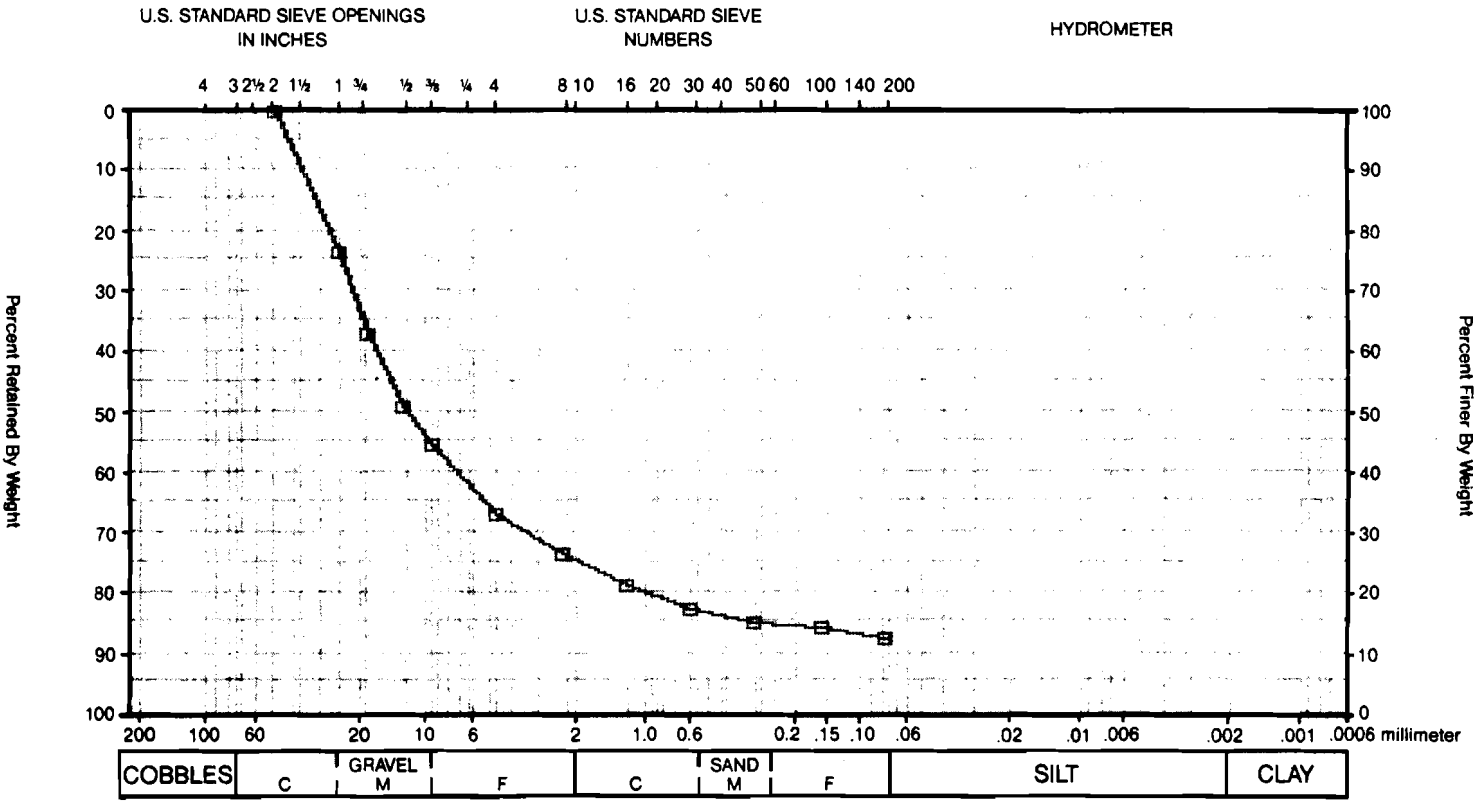
JG

RUST ENVIRONMENT & INFRASTRUCTURE

Formerly DUNN Corporation

CLIENT: NYS DEC, GLADDING CORDAGE SITE
LAB NUMBER: 7-94-23/37537.002 DATE RECEIVED: 7/6/94
TEST BY: REF DATE TESTED: 7/8/94
REVIEWED BY: WBC DATE REPORTED: 7/12/94
SAMPLE DESCR: RW-1, S-7, 52-54 feet

GRAIN SIZE DISTRIBUTION



COARSE

SIZE (inches)	PERCENT RETAINED	CUMULATIVE PERCENT PASSING	SPECS.
2	0.00	100.00	
1	23.04	76.96	
3/4	14.04	62.92	
1/2	12.03	50.90	
3/8	5.94	44.95	

FINE

SIEVE	PERCENT RETAINED	CUMULATIVE PERCENT PASSING	SPECS.
4	11.42	33.53	
8	6.92	26.61	
16	5.28	21.33	
30	3.87	17.46	
50	2.14	15.32	
100	1.11	14.20	
200	1.65	12.55	

HYDROMETER

PARTICLE DIAMETER (mm)	PERCENT PASSING	SPECS.

Pan = 12.55%
Wash Loss Was Not Tested.

SPECIFICATION: ASTM C 136
TEST STANDARD:
NOTES: ALL SAMPLES WERE TAKEN FROM A 3 inch O.D. SPLIT SPOON

Test Samples are retained for 30 days after submission and then discarded, unless other arrangements are made.

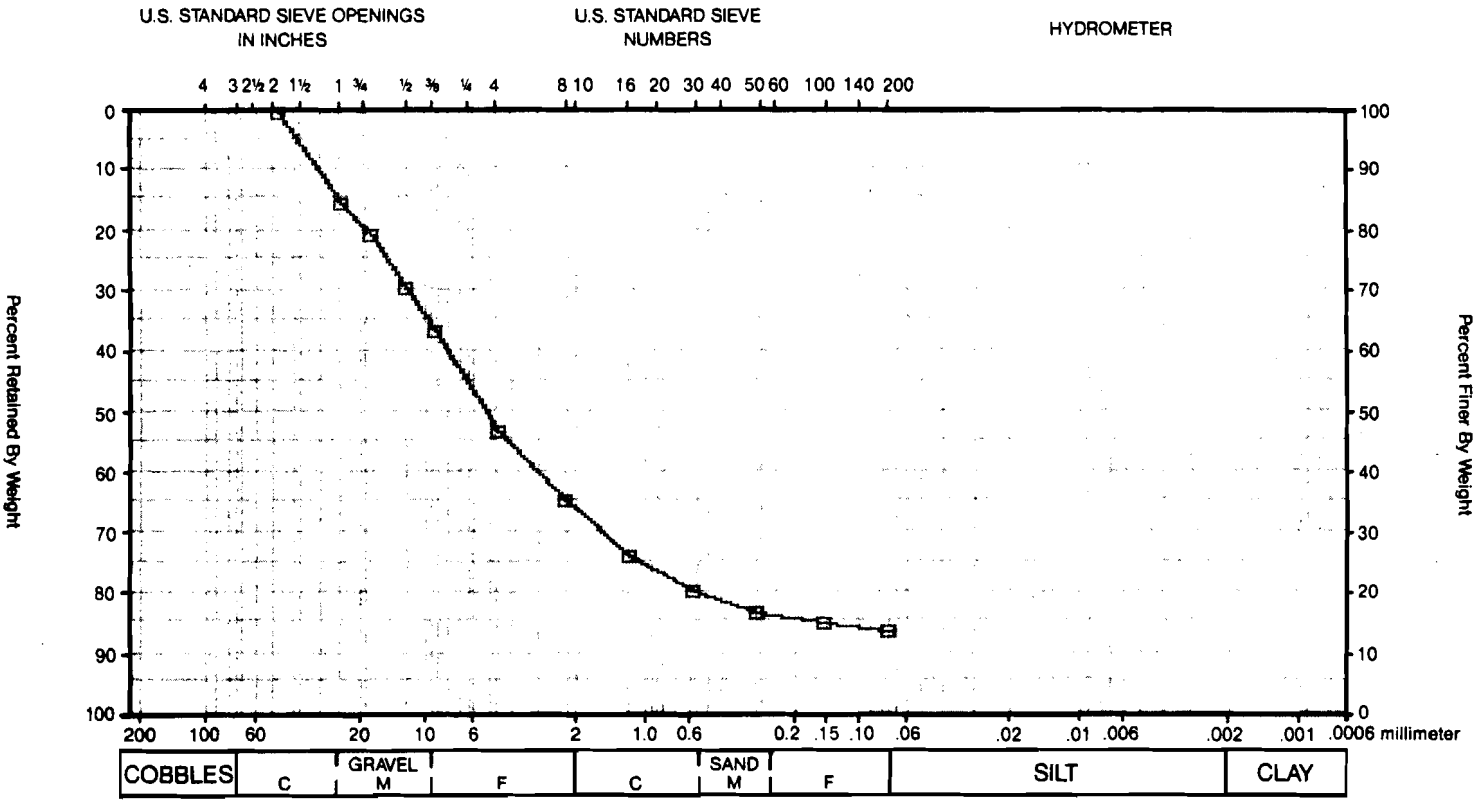
J6

RUST ENVIRONMENT & INFRASTRUCTURE

Formerly DUNN Corporation

CLIENT: NYS DEC, GLADDING CORDAGE SITE
LAB NUMBER: 7-94-24/37537.002 DATE RECEIVED: 7/6/94
TEST BY: REF DATE TESTED: 7/8/94
REVIEWED BY: WSC DATE REPORTED: 7/12/94
SAMPLE DESCR: RW-1, S-8, 54-56 feet

GRAIN SIZE DISTRIBUTION



COARSE

SIZE (inches)	PERCENT RETAINED	CUMULATIVE PERCENT PASSING	SPECS.
2	0.00	100.00	
1	15.22	84.78	
3/4	5.42	79.36	
1/2	8.70	70.66	
3/8	7.24	63.42	

FINE

SIEVE	PERCENT RETAINED	CUMULATIVE PERCENT PASSING	SPECS.
4	16.38	47.04	
8	11.65	35.39	
16	9.15	26.24	
30	5.80	20.44	
50	3.43	17.01	
100	1.70	15.31	
200	1.46	13.85	

HYDROMETER

PARTICLE DIAMETER (mm)	PERCENT PASSING	SPECS.

Pan = 13.85%
Wash Loss Was Not Tested.

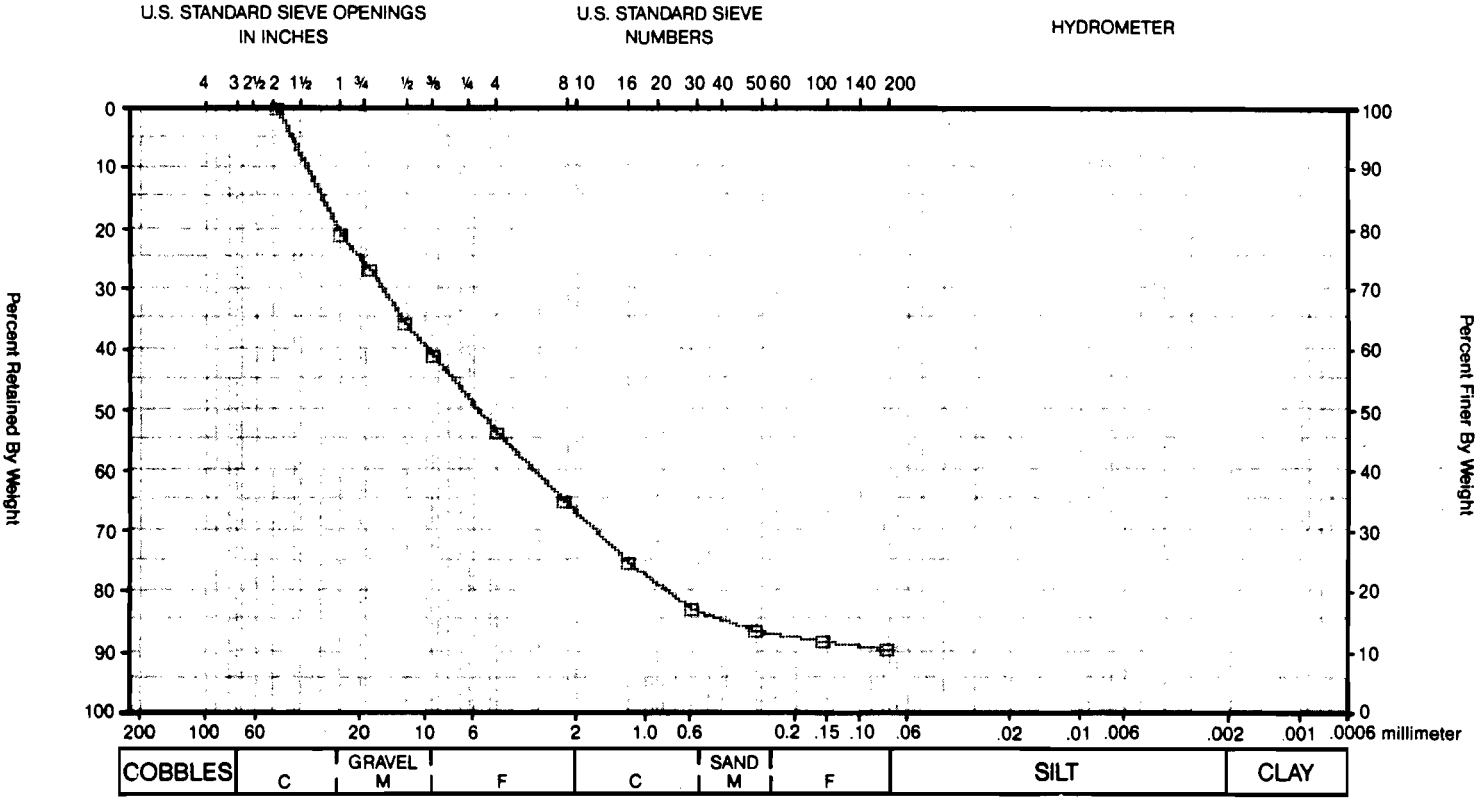
SPECIFICATION: ASTM C 136
TEST STANDARD:
NOTES: ALL SAMPLES WERE TAKEN FROM A 3 inch O.D. SPLIT SPOON

Test Samples are retained for 30 days after submission and then discarded, unless other arrangements are made.

J6

CLIENT: NYS DEC, GLADDING CORDAGE SITE
LAB NUMBER: 6-94-61/37537.002 DATE RECEIVED: 6/29/94
TEST BY: KASJ DATE TESTED: 6/30/94
REVIEWED BY: WSC DATE REPORTED: 7/6/94
SAMPLE DESCR: RW-1, S-9, 56-58 feet

GRAIN SIZE DISTRIBUTION



COARSE

SIZE (inches)	PERCENT RETAINED	CUMULATIVE PERCENT PASSING	SPECS.
2	0.00	100.00	
1	20.88	79.12	
3/4	5.75	73.36	
1/2	9.01	64.36	
3/8	5.28	59.08	

FINE

SIEVE	PERCENT RETAINED	CUMULATIVE PERCENT PASSING	SPECS.
4	12.86	46.22	
8	11.55	34.67	
16	10.22	24.44	
30	7.38	17.06	
50	3.85	13.21	
100	1.79	11.42	
200	1.08	10.34	

HYDROMETER

PARTICLE DIAMETER (mm)	PERCENT PASSING	SPECS.

Pan = 10.34%
Wash Loss Was Not Tested.

SPECIFICATION: ASTM C 136
TEST STANDARD:
NOTES: ALL SAMPLES WERE TAKEN FROM A 3 inch O.D. SPLIT SPOON

Test Samples are retained for 30 days after submission and then discarded, unless other arrangements are made.

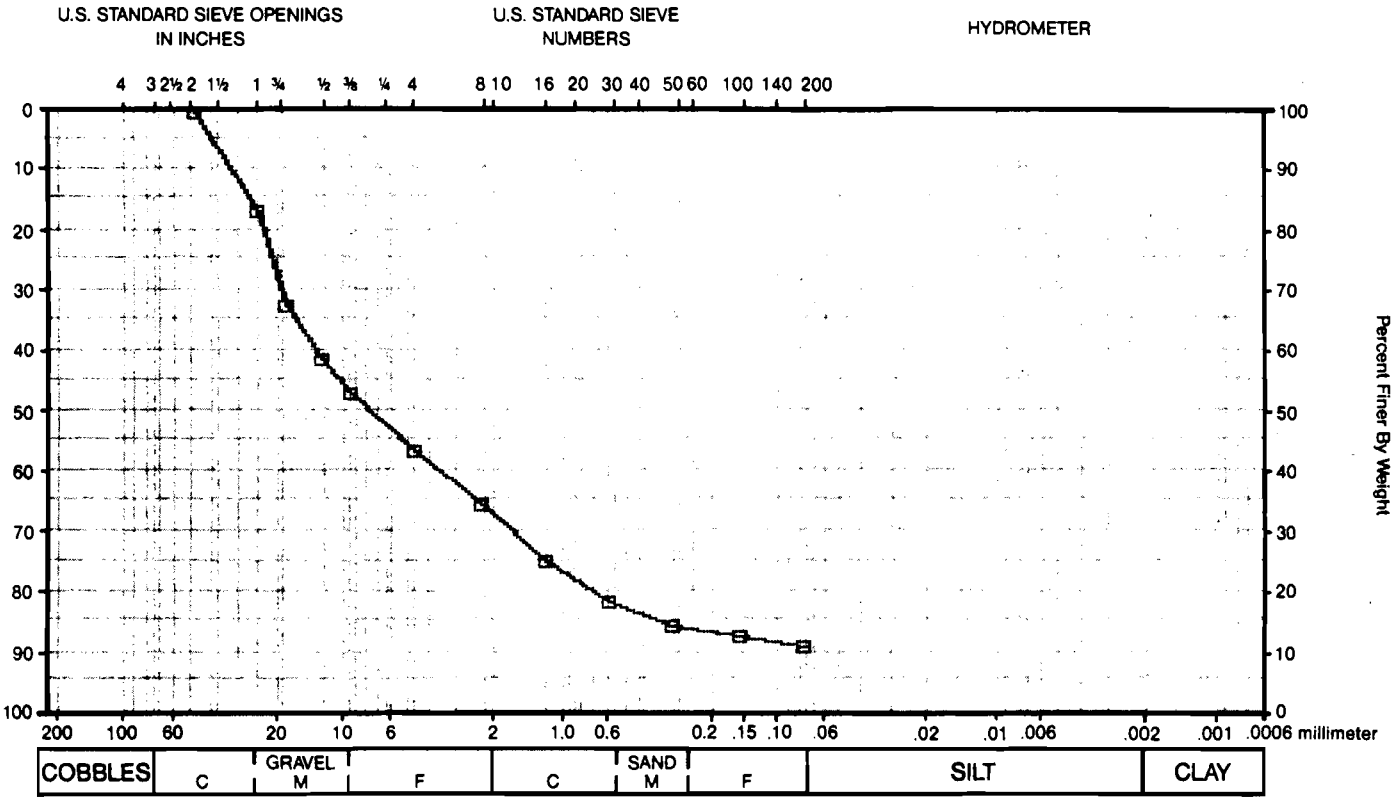
JG

RUST ENVIRONMENT & INFRASTRUCTURE

Formerly DUNN Corporation

CLIENT: NYS DEC, GLADDING CORDAGE SITE
LAB NUMBER: 7-94-25/37537.002 DATE RECEIVED: 7/6/94
TEST BY: REF DATE TESTED: 7/8/94
REVIEWED BY: WBC DATE REPORTED: 7/12/94
SAMPLE DESCR: RW-1, S-10, 58-60 feet

GRAIN SIZE DISTRIBUTION



COARSE

SIZE (inches)	PERCENT RETAINED	CUMULATIVE PERCENT PASSING	SPECS.
2	0.00	100.00	
1	16.46	83.54	
3/4	15.51	68.04	
1/2	8.72	59.31	
3/8	5.95	53.36	

FINE

SIEVE	PERCENT RETAINED	CUMULATIVE PERCENT PASSING	SPECS.
4	9.76	43.60	
8	8.82	34.79	
16	9.43	25.35	
30	6.87	18.49	
50	3.74	14.74	
100	1.95	12.80	
200	1.52	11.28	

HYDROMETER

PARTICLE DIAMETER (mm)	PERCENT PASSING	SPECS.

Pan = 11.28%
Wash Loss Was Not Tested.

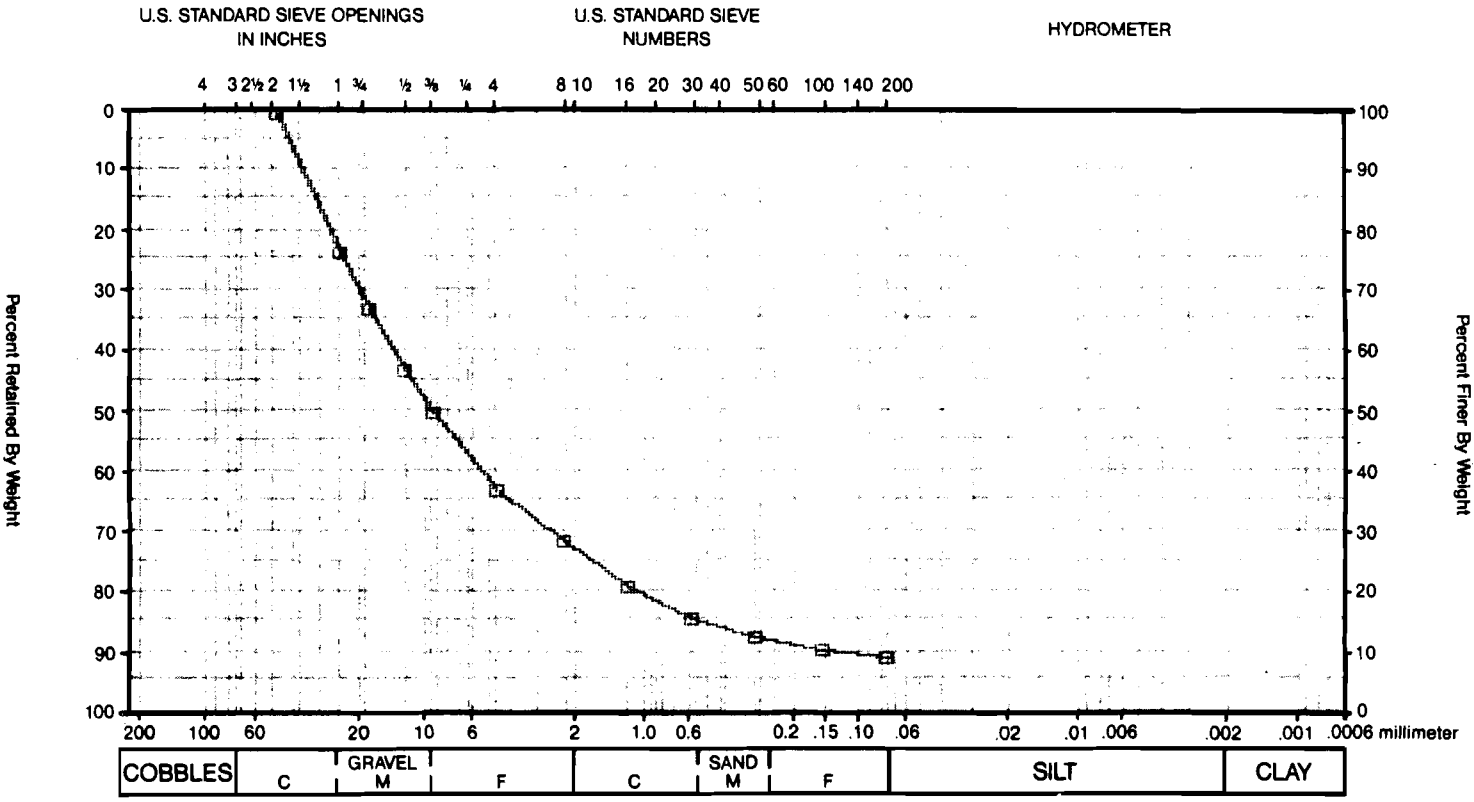
SPECIFICATION: ASTM C 136
TEST STANDARD:
NOTES: ALL SAMPLES WERE TAKEN FROM A 3 inch O.D. SPLIT SPOON

Test Samples are retained for 30 days after submission and then discarded, unless other arrangements are made.

JG

CLIENT: NYS DEC, GLADDING CORDAGE SITE
LAB NUMBER: 6-94-62/37537.002 DATE RECEIVED: 6/29/94
TEST BY: KASJ DATE TESTED: 6/30/94
REVIEWED BY: WSC DATE REPORTED: 7/6/94
SAMPLE DESCR: RW-1, S-11, 60-62 feet

GRAIN SIZE DISTRIBUTION



COARSE

SIZE (inches)	PERCENT RETAINED	CUMULATIVE PERCENT PASSING	SPECS.
2	0.00	100.00	
1	23.30	76.70	
3/4	8.95	67.75	
1/2	10.53	57.23	
3/8	6.99	50.24	

FINE

SIEVE	PERCENT RETAINED	CUMULATIVE PERCENT PASSING	SPECS.
4	12.76	37.48	
8	8.76	28.72	
16	7.41	21.31	
30	5.38	15.93	
50	3.22	12.71	
100	2.01	10.70	
200	1.20	9.50	

HYDROMETER

PARTICLE DIAMETER (mm)	PERCENT PASSING	SPECS.

Pan = 9.50%
Wash Loss Was Not Tested.

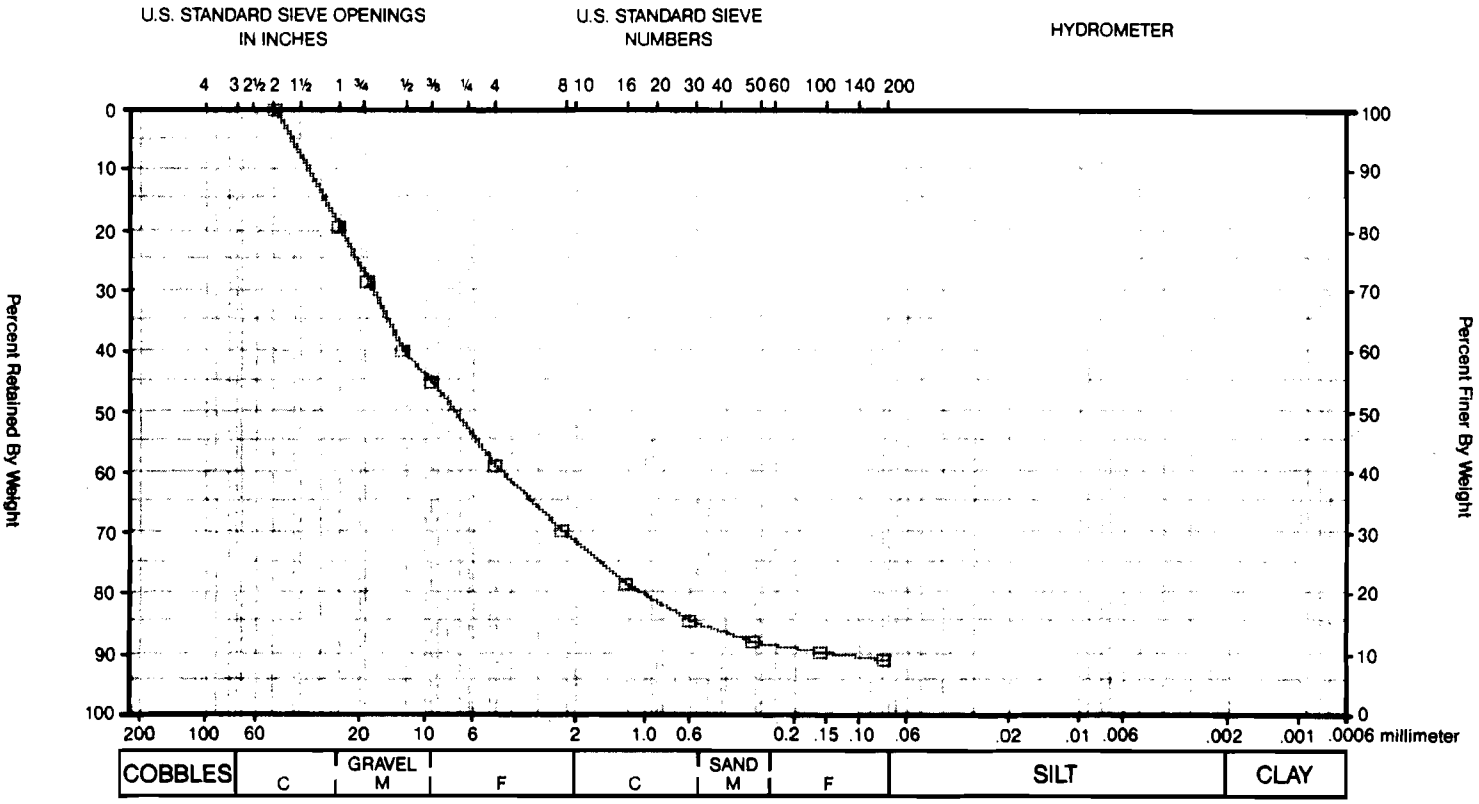
SPECIFICATION: ASTM C 136
TEST STANDARD:
NOTES: ALL SAMPLE WERE TAKEN FROM A 3 inch O.D. SPLIT SPOON

Test Samples are retained for 30 days after submission and then discarded, unless other arrangements are made.

JG

CLIENT: NYS DEC, GLADDING CORDAGE SITE
LAB NUMBER: 6-94-63/37537.002 DATE RECEIVED: 6/29/94
TEST BY: KASJ DATE TESTED: 6/30/94
REVIEWED BY: WSC DATE REPORTED: 7/6/94
SAMPLE DESCR: RW-1, S-12, 62-64 feet

GRAIN SIZE DISTRIBUTION



COARSE

SIZE (inches)	PERCENT RETAINED	CUMULATIVE PERCENT PASSING	SPECS.
2	0.00	100.00	
1	19.53	80.47	
3/4	9.08	71.39	
1/2	11.20	60.19	
3/8	5.68	54.50	

FINE

SIEVE	PERCENT RETAINED	CUMULATIVE PERCENT PASSING	SPECS.
4	13.41	41.10	
8	10.95	30.15	
16	8.83	21.31	
30	6.14	15.17	
50	3.51	11.67	
100	2.07	9.60	
200	1.33	8.27	

HYDROMETER

PARTICLE DIAMETER (mm)	PERCENT PASSING	SPECS.

Pan = 8.27%
Wash Loss Was Not Tested.

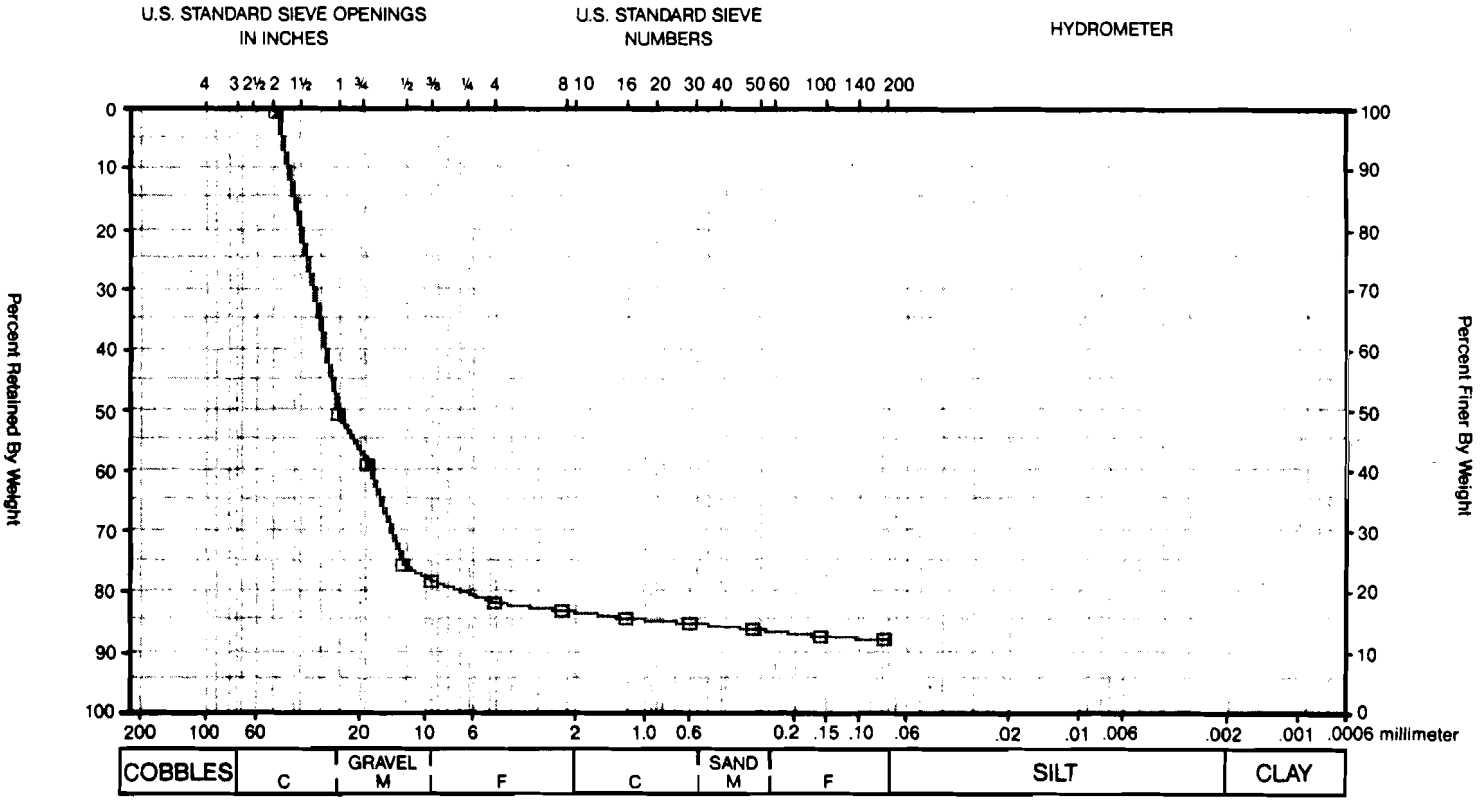
SPECIFICATION: ASTM C 136
TEST STANDARD:
NOTES: ALL SAMPLES WERE TAKEN FROM A 3 inch O.D. SPLIT SPOON

Test Samples are retained for 30 days after submission and then discarded, unless other arrangements are made.

JG

CLIENT: NYS DEC, GALDDING CORDAGE SITE
LAB NUMBER: 7-94-26/37537.002 DATE RECEIVED: 7/6/94
TEST BY: REF DATE TESTED: 7/8/94
REVIEWED BY: WSC DATE REPORTED: 7/12/94
SAMPLE DESCR: RW-1, S-13, 64-66 feet

GRAIN SIZE DISTRIBUTION



COARSE

SIZE (Inches)	PERCENT RETAINED	CUMULATIVE PERCENT PASSING	SPECS.
2	0.00	100.00	
1	50.24	49.76	
3/4	8.26	41.50	
1/2	16.60	24.90	
3/8	2.72	22.18	

FINE

SIEVE	PERCENT RETAINED	CUMULATIVE PERCENT PASSING	SPECS.
4	3.33	18.85	
8	1.48	17.36	
16	1.36	16.01	
30	1.00	15.01	
50	0.98	14.03	
100	0.98	13.05	
200	0.74	12.31	

HYDROMETER

PARTICLE DIAMETER (mm)	PERCENT PASSING	SPECS.

Pan = 12.31%
Wash Loss Was Not Tested.

SPECIFICATION: ASTM C 136
TEST STANDARD:
NOTES: ALL SAMPLES WERE TAKEN FROM A 3 inch O.D. SPLIT SPOON

Test Samples are retained for 30 days after submission and then discarded, unless other arrangements are made.

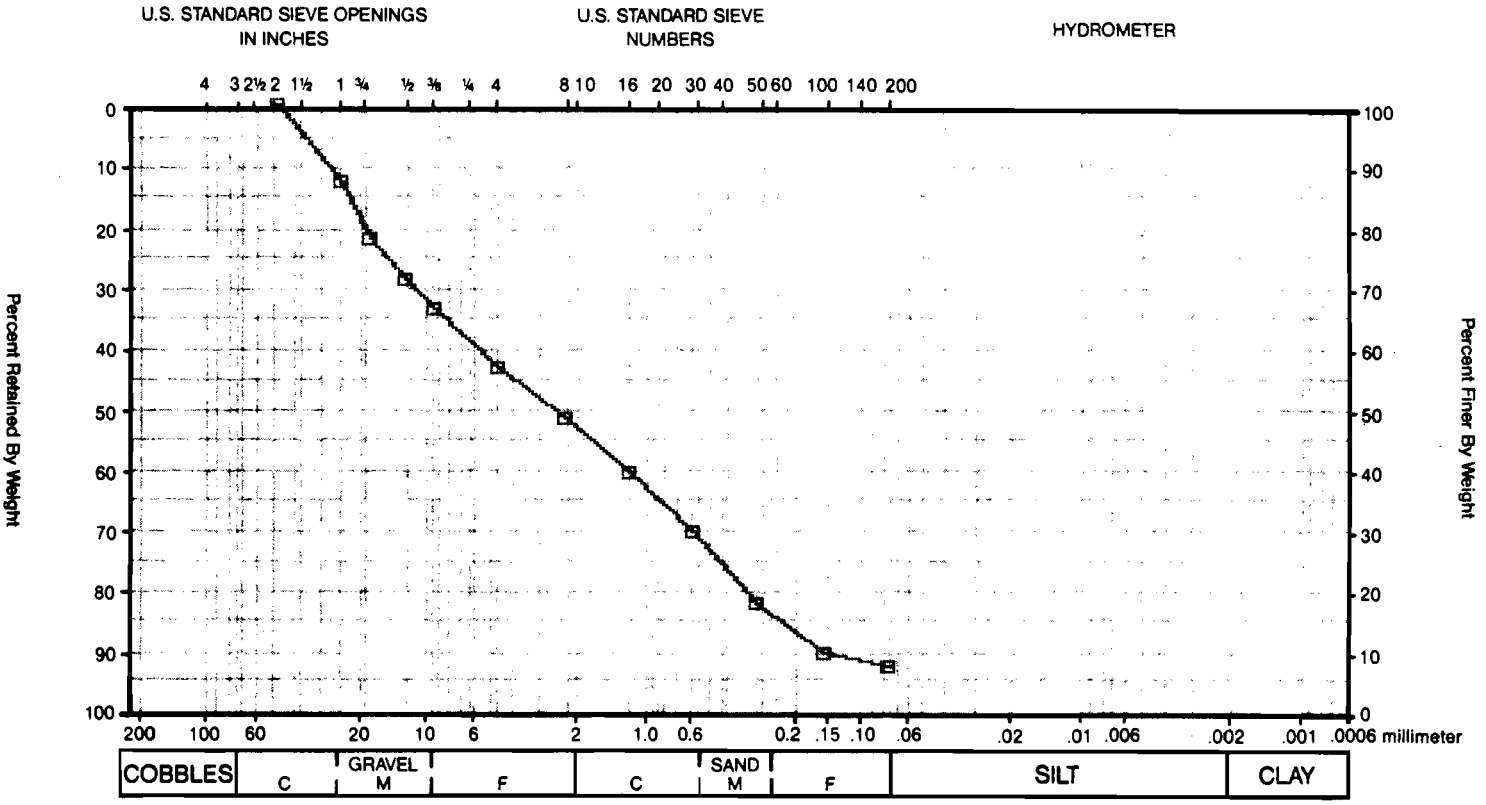
J6

RUST ENVIRONMENT & INFRASTRUCTURE

Formerly DUNN Corporation

CLIENT: NYS DEC, GLADDING CORDAGE SITE
LAB NUMBER: 7-94-27/37537.002 DATE RECEIVED: 7/6/94
TEST BY: REF DATE TESTED: 7/8/94
REVIEWED BY: WSC DATE REPORTED: 7/12/94
SAMPLE DESCR: RW-1, S-14, 66-68 feet

GRAIN SIZE DISTRIBUTION



COARSE

SIZE (inches)	PERCENT RETAINED	CUMULATIVE PERCENT PASSING	SPECS.
2	0.00	100.00	
1	12.75	87.25	
3/4	9.42	77.83	
1/2	6.58	71.24	
3/8	5.11	66.14	

FINE

SIEVE	PERCENT RETAINED	CUMULATIVE PERCENT PASSING	SPECS.
4	9.79	56.35	
8	8.38	47.97	
16	8.90	39.07	
30	9.57	29.50	
50	12.09	17.41	
100	8.61	8.79	
200	2.28	6.51	

HYDROMETER

PARTICLE DIAMETER (mm)	PERCENT PASSING	SPECS.

Pan = 6.51%
Wash Loss Was Not Tested.

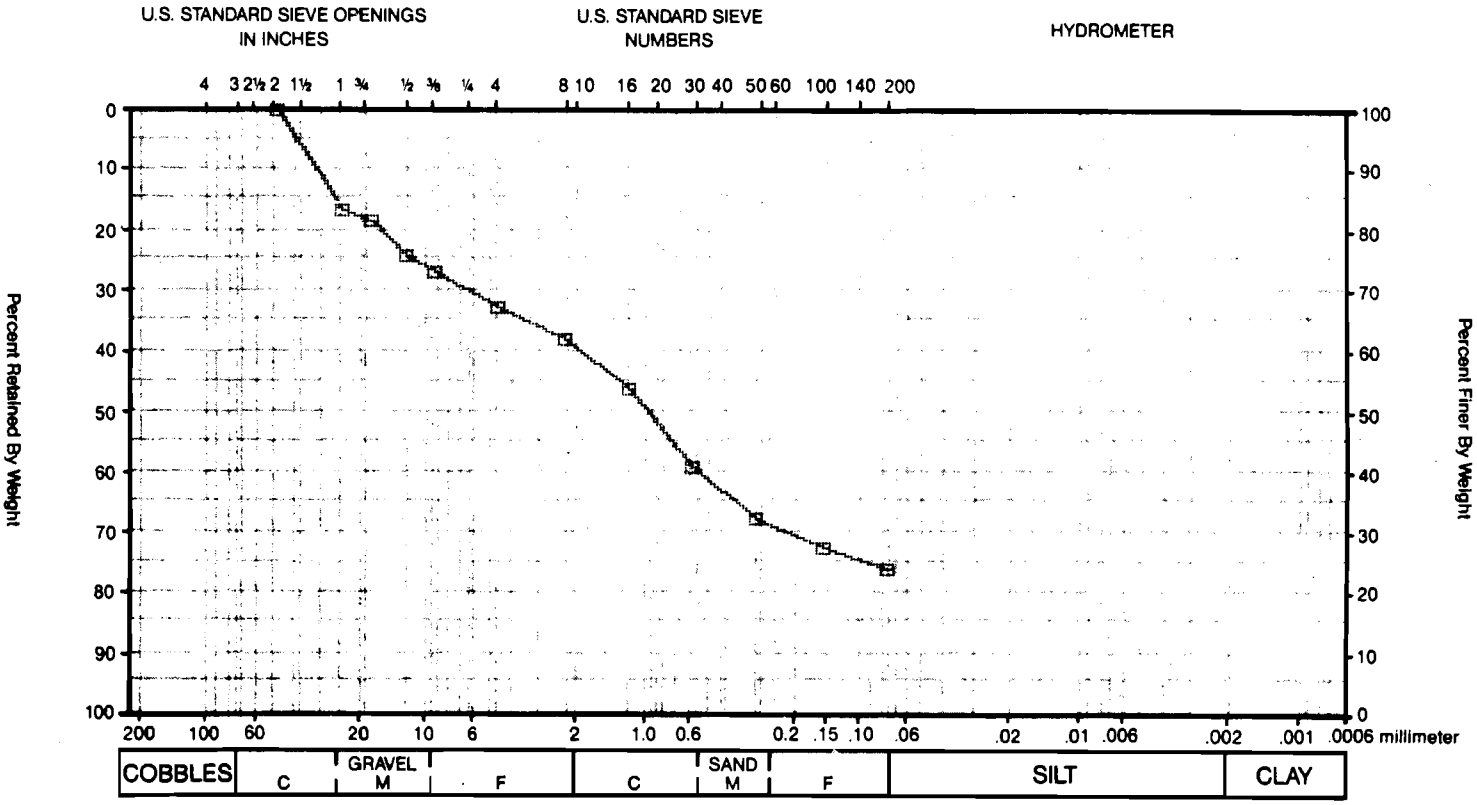
SPECIFICATION: ASTM C 136
TEST STANDARD:
NOTES: ALL SAMPLES WERE TAKEN FROM A 3 inch O.D. SPLIT SPOON

Test Samples are retained for 30 days after submission and then discarded, unless other arrangements are made.

J6

CLIENT: NYS DEC, GLADDING CORDAGE SITE
LAB NUMBER: 6-94-64/37537.002 DATE RECEIVED: 6/29/94
TEST BY: KASJ DATE TESTED: 6/30/94
REVIEWED BY: WSC DATE REPORTED: 7/5/94
SAMPLE DESCR: RW-1, S-15, 68-70 feet

GRAIN SIZE DISTRIBUTION



COARSE

SIZE (Inches)	PERCENT RETAINED	CUMULATIVE PERCENT PASSING	SPECS.
2	0.00	100.00	
1	16.32	83.68	
3/4	1.91	81.78	
1/2	5.59	76.18	
3/8	2.66	73.53	

FINE

SIEVE	PERCENT RETAINED	CUMULATIVE PERCENT PASSING	SPECS.
4	5.82	67.70	
8	5.35	62.35	
16	8.79	53.56	
30	12.60	40.96	
50	8.55	32.42	
100	4.64	27.78	
200	3.86	23.92	

HYDROMETER

PARTICLE DIAMETER (mm)	PERCENT PASSING	SPECS.

Pan = 23.92%
Wash Loss Was Not Tested.

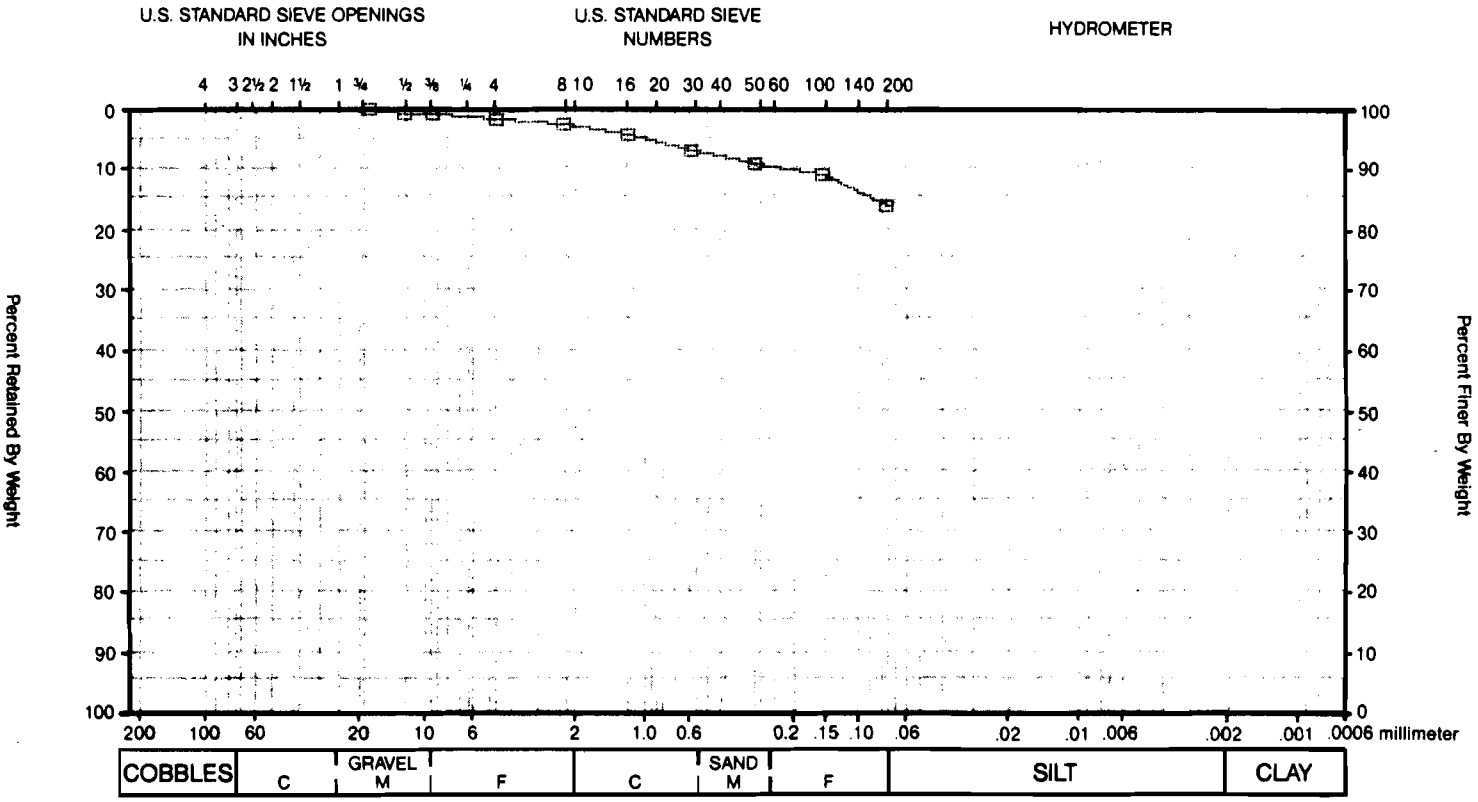
SPECIFICATION: ASTM C 136
TEST STANDARD:
NOTES: ALL SAMPLES TAKEN FROM A 3 INCH O.D. SPLIT SPOON

Test Samples are retained for 30 days after submission and then discarded, unless other arrangements are made.

JG

CLIENT: NYS DEC, GLADDING CORDAGE SITE
LAB NUMBER: 6-94-65/37537.002 DATE RECEIVED: 6/29/94
TEST BY: KASJ DATE TESTED: 6/30/94
REVIEWED BY: WSC DATE REPORTED: 7/6/94
SAMPLE DESCR: RW-1, S-16, 70-72 feet

GRAIN SIZE DISTRIBUTION



COARSE

SIZE (inches)	PERCENT RETAINED	CUMULATIVE PERCENT PASSING	SPECS.
3/4	0.00	100.00	
1/2	0.98	99.02	
3/8	0.11	98.91	

FINE

SIEVE	PERCENT RETAINED	CUMULATIVE PERCENT PASSING	SPECS.
4	0.77	98.14	
8	0.96	97.18	
16	1.83	95.35	
30	2.48	92.87	
50	1.99	90.88	
100	1.92	88.96	
200	5.33	83.63	

HYDROMETER

PARTICLE DIAMETER (mm)	PERCENT PASSING	SPECS.

Pan = 83.63%
Wash Loss Was Not Tested.

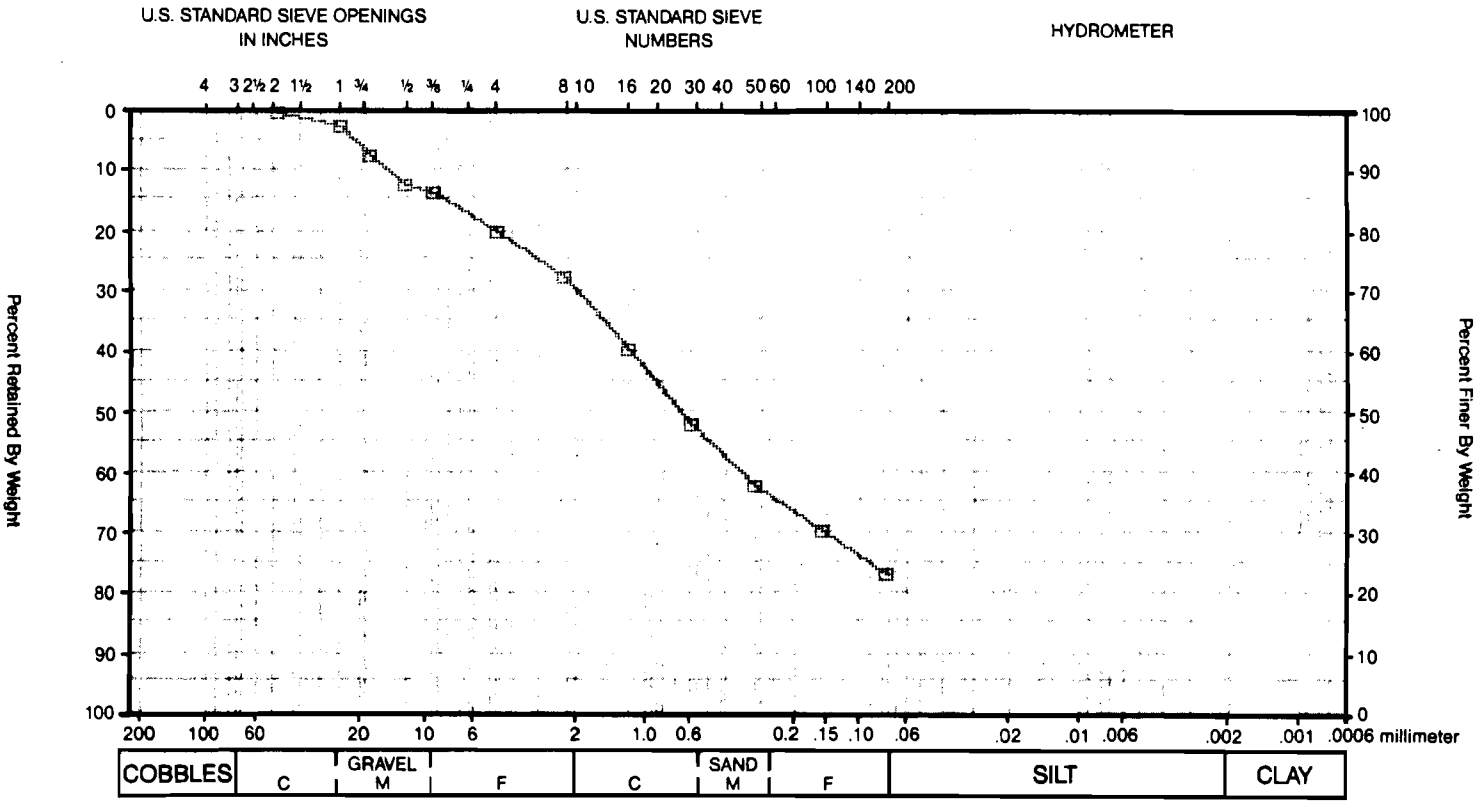
SPECIFICATION: ASTM C 136
TEST STANDARD:
NOTES: ALL SAMPLES WERE TAKEN FROM A 3 inch O.D. SPLIT SPOON

Test Samples are retained for 30 days after submission and then discarded, unless other arrangements are made.

J6

CLIENT: NYS DEC, GLADDING CORDAGE SITE
LAB NUMBER: 6-94-66/37537.002 DATE RECEIVED: 6/29/94
TEST BY: KASJ DATE TESTED: 6/30/94
REVIEWED BY: WSC DATE REPORTED: 7/6/94
SAMPLE DESCR: RW-1, S-17, 72-74 feet

GRAIN SIZE DISTRIBUTION



COARSE

SIZE (inches)	PERCENT RETAINED	CUMULATIVE PERCENT PASSING	SPECS.
2	0.00	100.00	
1	2.25	97.75	
3/4	5.07	92.68	
1/2	4.50	88.18	
3/8	1.62	86.55	

FINE

SIEVE	PERCENT RETAINED	CUMULATIVE PERCENT PASSING	SPECS.
4	6.42	80.13	
8	7.80	72.34	
16	11.84	60.49	
30	12.50	47.99	
50	9.99	38.00	
100	7.77	30.23	
200	6.90	23.32	

HYDROMETER

PARTICLE DIAMETER (mm)	PERCENT PASSING	SPECS.

Pan = 23.32%
Wash Loss Was Not Tested.

SPECIFICATION: ASTM C 136
TEST STANDARD:
NOTES: ALL SAMPLES WERE TAKEN FROM A 3 inch O.D. SPLIT SPOON

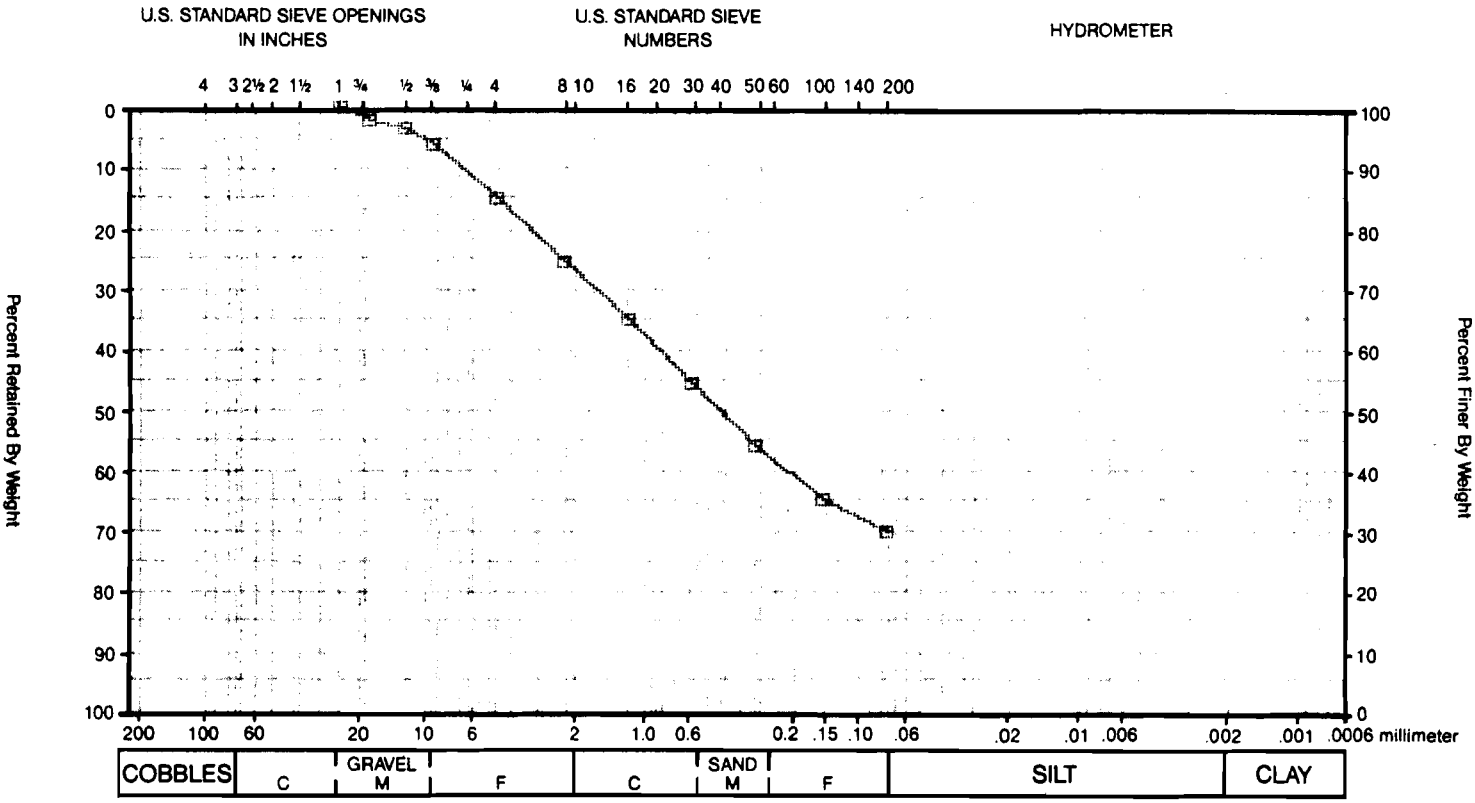
Test Samples are retained for 30 days after submission and then discarded, unless other arrangements are made.

RUST ENVIRONMENT & INFRASTRUCTURE

Formerly DUNN Corporation

CLIENT: NYS DEC, GLADDING CORDAGE SITE
LAB NUMBER: 6-94-67/37537.002 DATE RECEIVED: 6/29/94
TEST BY: KASJ DATE TESTED: 6/30/94
REVIEWED BY: WSC DATE REPORTED: 7/6/94
SAMPLE DESCR: RW-1, S-18, 74-76 feet

GRAIN SIZE DISTRIBUTION



COARSE

SIZE (inches)	PERCENT RETAINED	CUMULATIVE PERCENT PASSING	SPECS.
1	0.00	100.00	
3/4	2.08	97.92	
1/2	1.36	96.56	
3/8	2.79	93.76	

FINE

SIEVE	PERCENT RETAINED	CUMULATIVE PERCENT PASSING	SPECS.
4	8.93	84.83	
8	10.77	74.06	
16	9.70	64.36	
30	10.76	53.60	
50	9.86	43.74	
100	9.06	34.68	
200	5.36	29.32	

HYDROMETER

PARTICLE DIAMETER (mm)	PERCENT PASSING	SPECS.

Pan = 29.32%
Wash Loss Was Not Tested.

SPECIFICATION: ASTM C 136
TEST STANDARD:
NOTES: ALL SAMPLES WERE TAKEN FROM A 3 inch O.D. SPLIT SPOON

Test Samples are retained for 30 days after submission and then discarded, unless other arrangements are made.

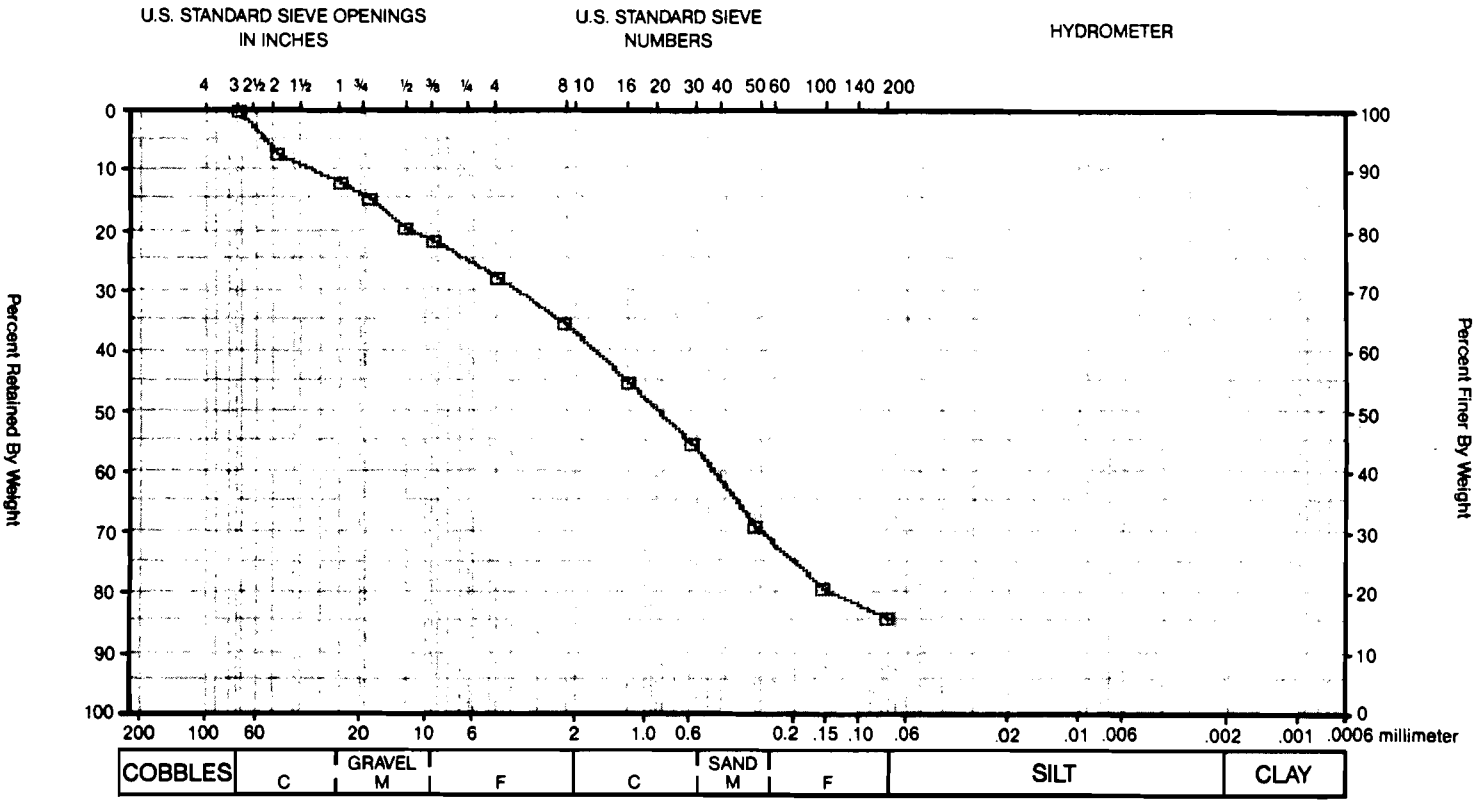
J6

RUST ENVIRONMENT & INFRASTRUCTURE

Formerly DUNN Corporation

CLIENT: NYS DEC, GLADDING CORDAGE SITE
LAB NUMBER: 7-94-30/37537.002 DATE RECEIVED: 7/6/94
TEST BY: REF DATE TESTED: 7/8/94
REVIEWED BY: WSC DATE REPORTED: 7/12/94
SAMPLE DESCR: RW-1, S-19, 76-78 feet

GRAIN SIZE DISTRIBUTION



COARSE

SIZE (Inches)	PERCENT RETAINED	CUMULATIVE PERCENT PASSING	SPECS.
3	0.00	100.00	
2	7.29	92.71	
1	4.65	88.05	
3/4	2.93	85.13	
1/2	4.56	80.56	
3/8	2.24	78.32	

FINE

SIEVE	PERCENT RETAINED	CUMULATIVE PERCENT PASSING	SPECS.
4	6.40	71.92	
8	7.70	64.23	
16	9.41	54.81	
30	10.23	44.59	
50	13.96	30.63	
100	10.02	20.61	
200	5.03	15.59	

HYDROMETER

PARTICLE DIAMETER (mm)	PERCENT PASSING	SPECS.

Pan = 15.59%
Wash Loss Was Not Tested.

SPECIFICATION: ASTM C 136
TEST STANDARD:
NOTES: ALL SAMPLES WERE TAKEN FROM A 3 inch O.D. SPLIT SPOON

Test Samples are retained for 30 days after submission and then discarded, unless other arrangements are made.

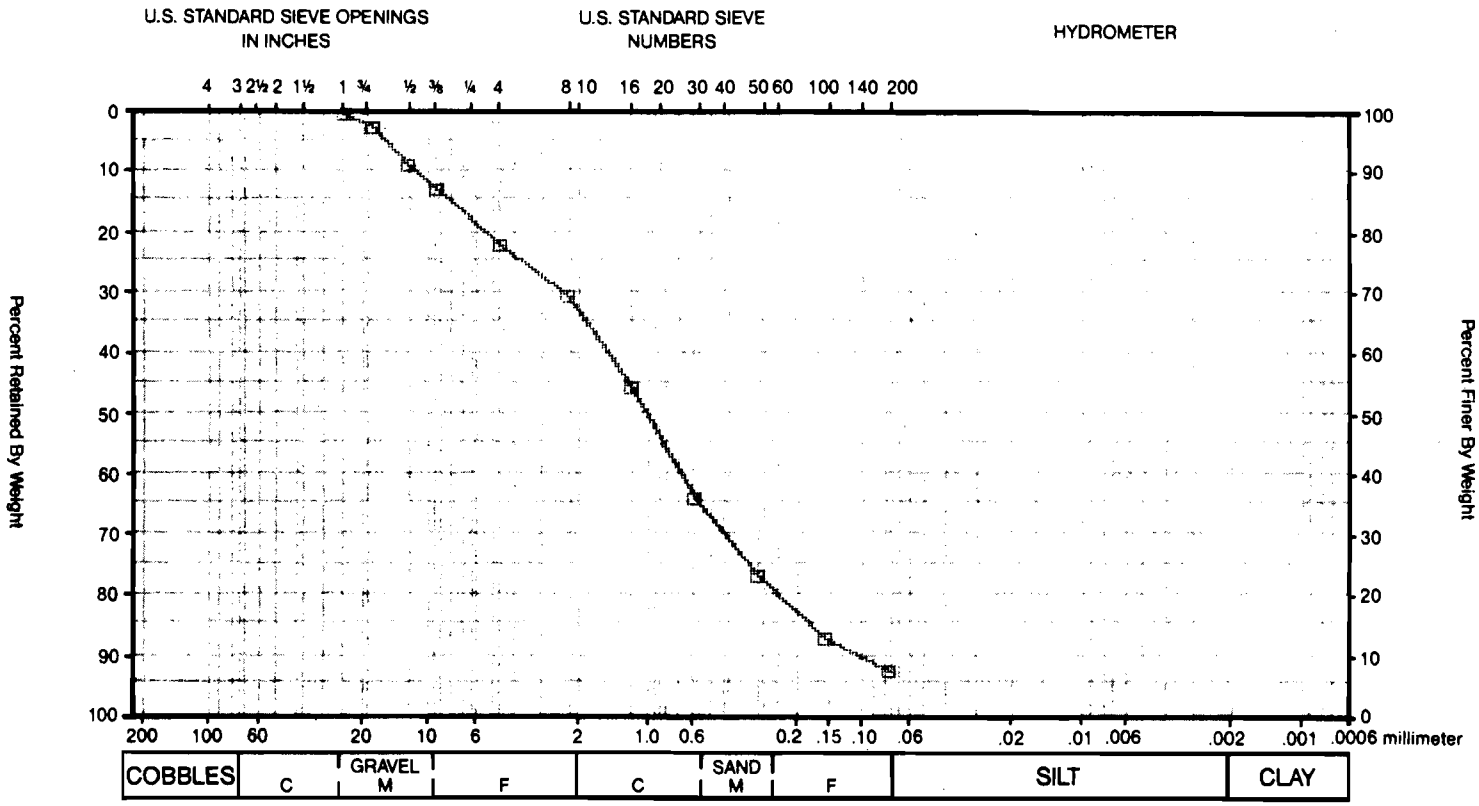
J6

RUST ENVIRONMENT & INFRASTRUCTURE

Formerly DUNN Corporation

CLIENT: NYS DEC, GLADDING CORDAGE SITE
LAB NUMBER: 6-94-68/37537.002 DATE RECEIVED: 6/29/94
TEST BY: KASJ DATE TESTED: 6/30/94
REVIEWED BY: WSC DATE REPORTED: 7/6/94
SAMPLE DESCR: RW-1, S-20, 78-80 feet

GRAIN SIZE DISTRIBUTION



COARSE

SIZE (Inches)	PERCENT RETAINED	CUMULATIVE PERCENT PASSING	SPECS.
1	0.00	100.00	
3/4	2.13	97.87	
1/2	6.42	91.45	
3/8	3.74	87.71	

FINE

SIEVE	PERCENT RETAINED	CUMULATIVE PERCENT PASSING	SPECS.
4	9.41	78.30	
8	8.72	69.58	
16	15.05	54.53	
30	18.62	35.92	
50	12.66	23.25	
100	10.38	12.87	
200	5.16	7.71	

HYDROMETER

PARTICLE DIAMETER (mm)	PERCENT PASSING	SPECS.

Pan = 7.71%
Wash Loss Was Not Tested.

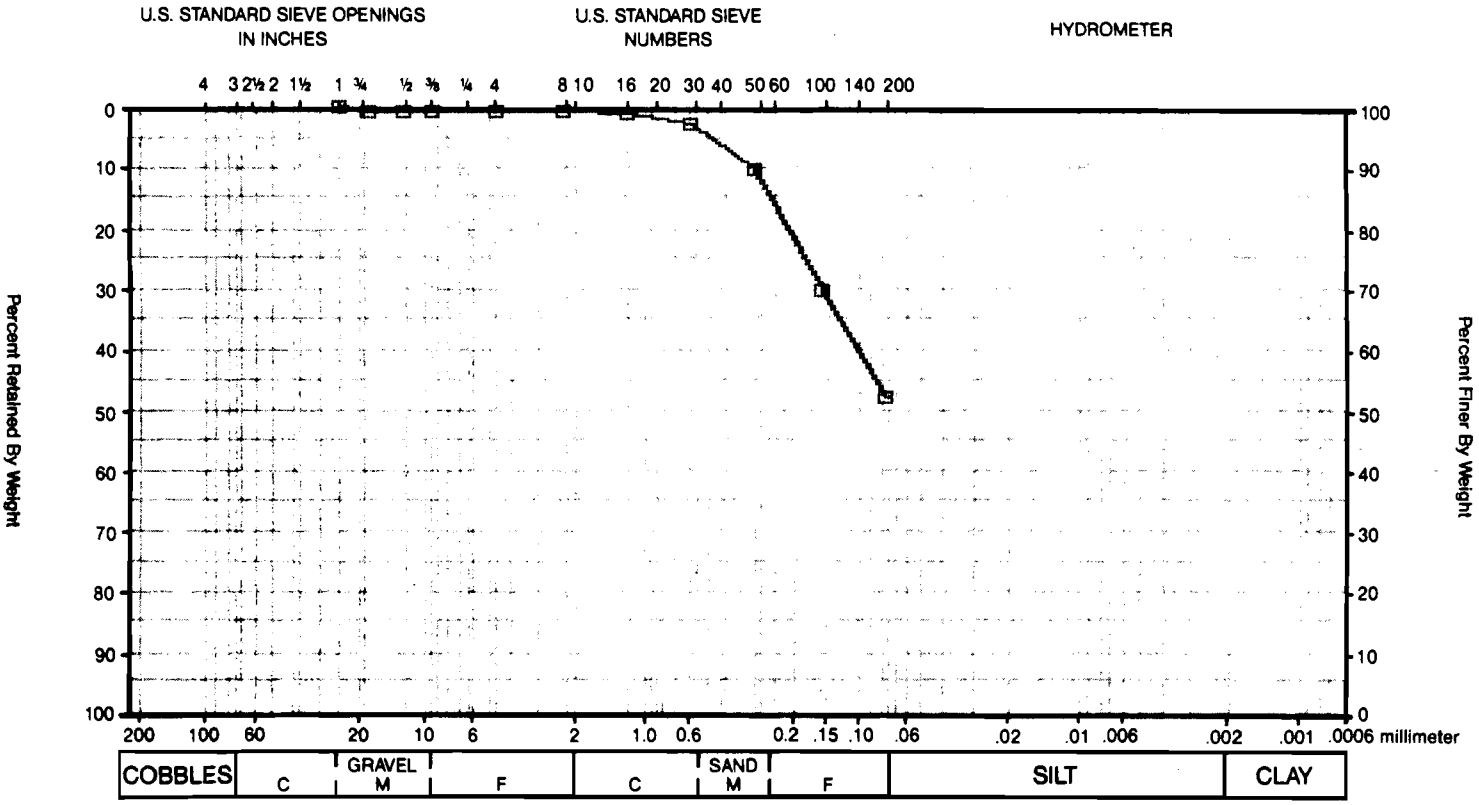
SPECIFICATION: ASTM C 136
TEST STANDARD:
NOTES: ALL SAMPLES WERE TAKEN FROM A 3 inch O.D. SPLIT SPOON

Test Samples are retained for 30 days after submission and then discarded, unless other arrangements are made.

JG

CLIENT: NYS DEC, GLADDING CORDAGE SITE
LAB NUMBER: 7-94-11/37537.002 DATE RECEIVED: 7/6/94
TEST BY: REF DATE TESTED: 7/8/94
REVIEWED BY: WSC DATE REPORTED: 7/11/94
SAMPLE DESCR: RW-2, 46-48 feet

GRAIN SIZE DISTRIBUTION



COARSE

SIZE (inches)	PERCENT RETAINED	CUMULATIVE PERCENT PASSING	SPECS.
1	0.00	100.00	
3/4	0.99	99.01	
1/2	0.00	99.01	
3/8	0.00	99.01	

FINE

SIEVE	PERCENT RETAINED	CUMULATIVE PERCENT PASSING	SPECS.
4	0.05	98.97	
8	0.07	98.90	
16	0.14	98.75	
30	1.97	96.78	
50	7.66	89.12	
100	19.80	69.32	
200	17.71	51.61	

HYDROMETER

PARTICLE DIAMETER (mm)	PERCENT PASSING	SPECS.

Pan = 51.61%
Wash Loss Was Not Tested.

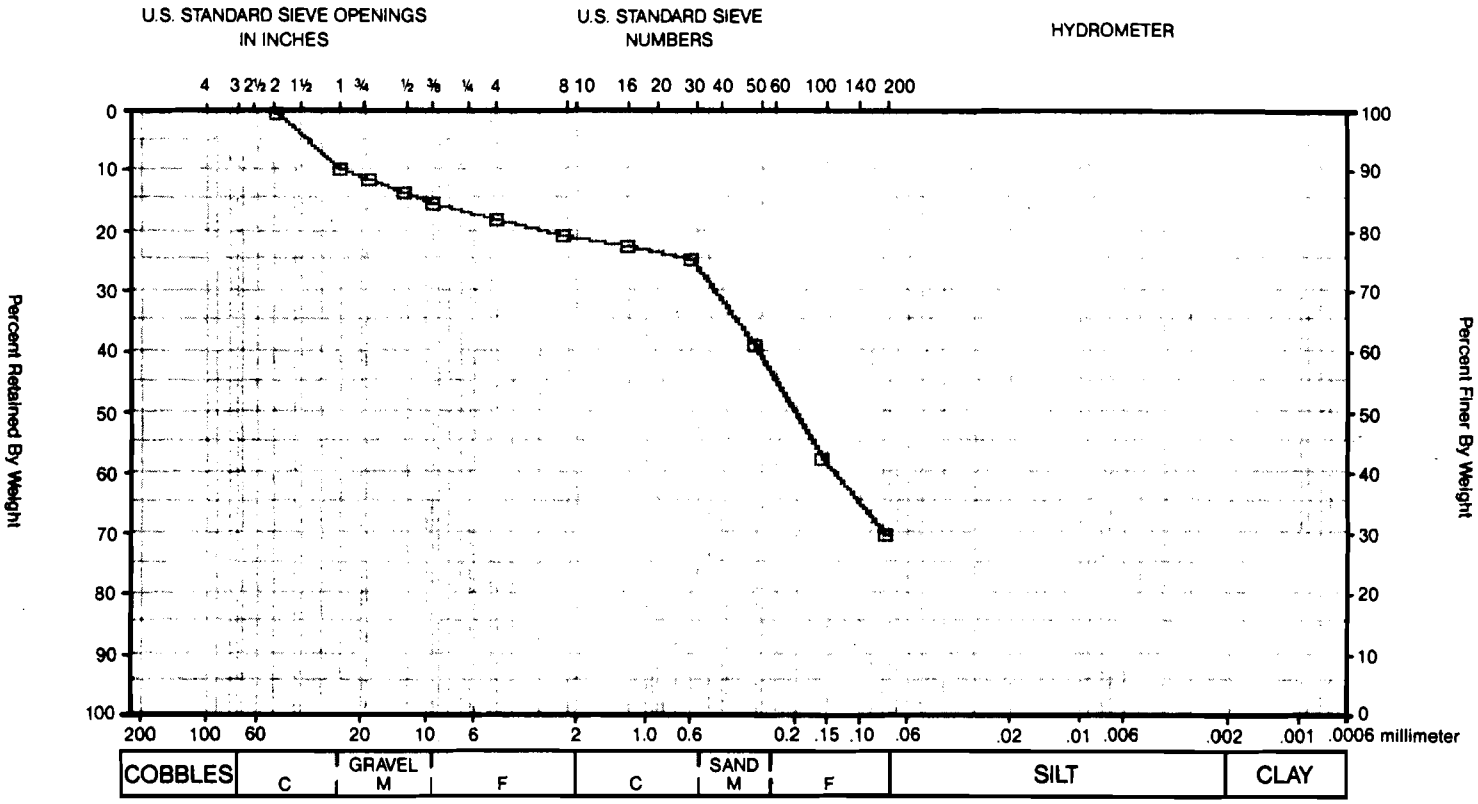
SPECIFICATION: ASTM C 136
TEST STANDARD:
NOTES: ALL SAMPLES WERE TAKEN FROM A 3 inch O.D. SPLIT SPOON

Test Samples are retained for 30 days after submission and then discarded, unless other arrangements are made.

J6

CLIENT: NYS DEC, GLADDING CORDAGE SITE
LAB NUMBER: 7-94-12/37537.002 DATE RECEIVED: 7/6/94
TEST BY: REF DATE TESTED: 7/8/94
REVIEWED BY: WSC DATE REPORTED: 7/11/94
SAMPLE DESCR: RW-2, 48-50 feet

GRAIN SIZE DISTRIBUTION



COARSE

SIZE (inches)	PERCENT RETAINED	CUMULATIVE PERCENT PASSING	SPECS.
2	0.00	100.00	
1	9.16	90.84	
3/4	1.85	88.99	
1/2	2.28	86.71	
3/8	1.68	85.03	

FINE

SIEVE	PERCENT RETAINED	CUMULATIVE PERCENT PASSING	SPECS.
4	2.99	82.04	
8	2.37	79.67	
16	1.71	77.96	
30	2.47	75.49	
50	14.35	61.14	
100	19.08	42.06	
200	12.10	29.96	

HYDROMETER

PARTICLE DIAMETER (mm)	PERCENT PASSING	SPECS.

Pan = 29.96%
Wash Loss Was Not Tested.

SPECIFICATION: ASTM C 136
TEST STANDARD:
NOTES: ALL SAMPLES WERE TAKEN FROM A 3 inch O.D. SPLIT SPOON

Test Samples are retained for 30 days after submission and then discarded, unless other arrangements are made.

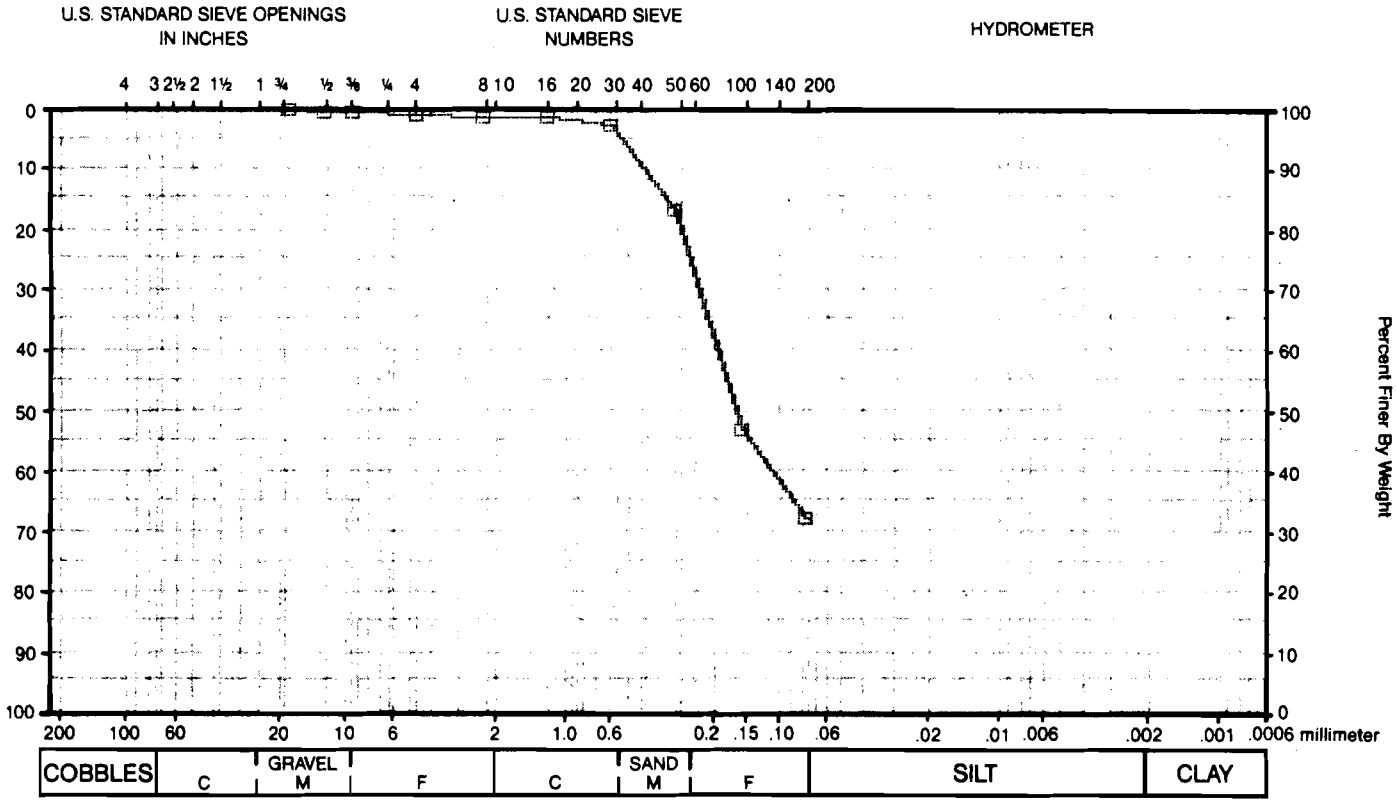
J6

RUST ENVIRONMENT & INFRASTRUCTURE

Formerly DUNN Corporation

CLIENT: NYS DEC. GLADDING CORDAGE SITE
LAB NUMBER: 7-94-1/37537.002 DATE RECEIVED: 6/30/94
TEST BY: KASJ DATE TESTED: 7/1/94
REVIEWED BY: WSC DATE REPORTED: 7/6/94
SAMPLE DESCR: RW-2, 50-52 feet

GRAIN SIZE DISTRIBUTION



COARSE

SIZE (Inches)	PERCENT RETAINED	CUMULATIVE PERCENT PASSING	SPECS.
3/4	0.00	100.00	
1/2	0.33	99.67	
3/8	0.28	99.39	

FINE

SIEVE	PERCENT RETAINED	CUMULATIVE PERCENT PASSING	SPECS.
4	0.23	99.16	
8	0.37	98.79	
16	0.22	98.57	
30	1.19	97.38	
50	14.06	83.32	
100	36.52	46.80	
200	14.80	32.00	

HYDROMETER

PARTICLE DIAMETER (mm)	PERCENT PASSING	SPECS.

Pan = 32.00%
Wash Loss Was Not Tested.

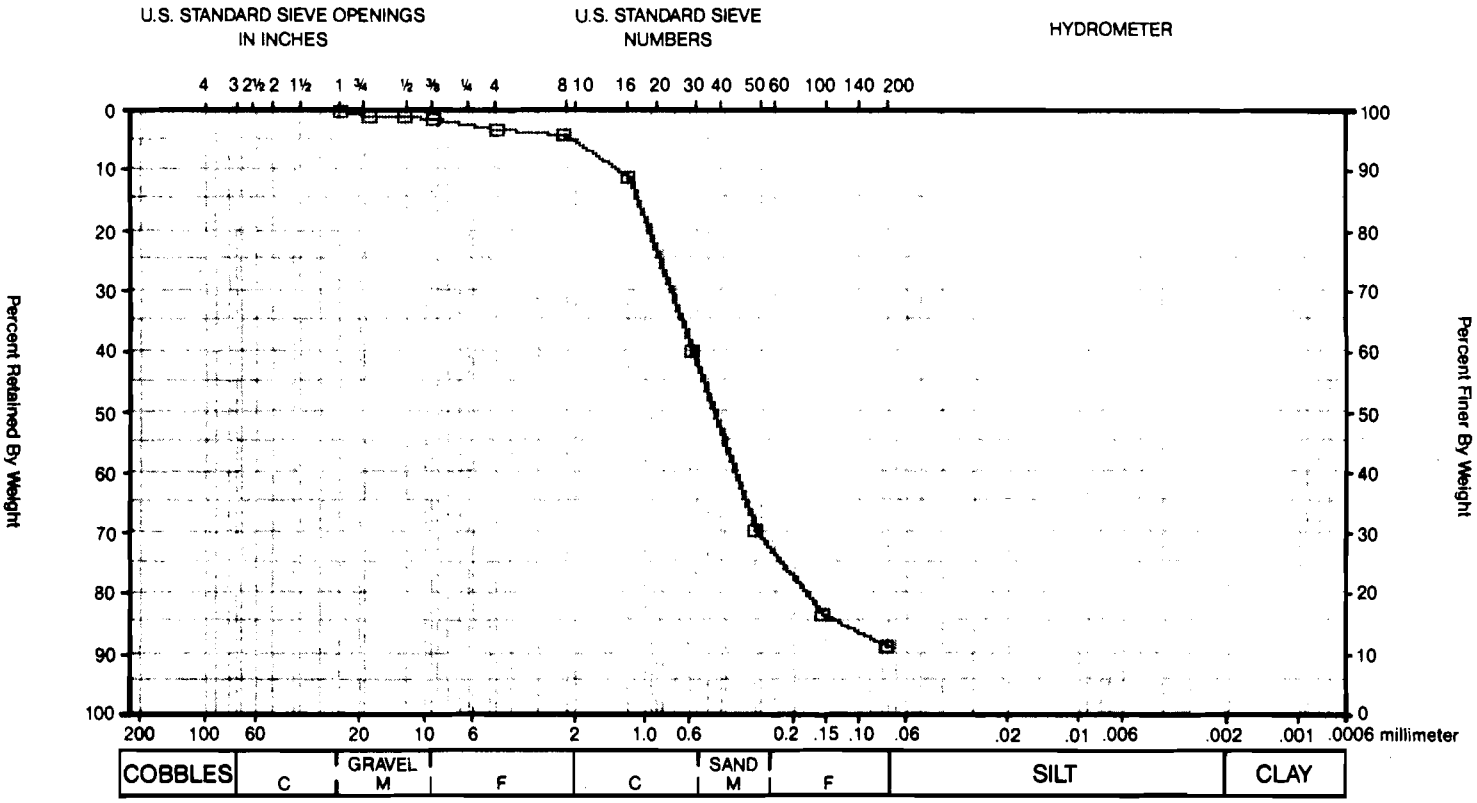
SPECIFICATION: ASTM C 136
TEST STANDARD:
NOTES: ALL SAMPLES WERE TAKEN FROM A 3 inch O.D. SPLIT SPOON

Test Samples are retained for 30 days after submission and then discarded, unless other arrangements are made.

JG

CLIENT: NYS DEC, GLADDING CORDAGE SITE
LAB NUMBER: 7-94-13/37537.002 DATE RECEIVED: 7/6/94
TEST BY: REF DATE TESTED: 7/8/94
REVIEWED BY: WSC DATE REPORTED: 7//1/94
SAMPLE DESCR: RW-2, 52-54 feet

GRAIN SIZE DISTRIBUTION



COARSE

SIZE (inches)	PERCENT RETAINED	CUMULATIVE PERCENT PASSING	SPECS.
1	0.00	100.00	
3/4	0.88	99.12	
1/2	0.00	99.12	
3/8	0.52	98.60	

FINE

SIEVE	PERCENT RETAINED	CUMULATIVE PERCENT PASSING	SPECS.
4	1.55	97.05	
8	1.21	95.83	
16	6.98	88.85	
30	29.05	59.80	
50	29.62	30.19	
100	13.67	16.51	
200	5.41	11.11	

HYDROMETER

PARTICLE DIAMETER (mm)	PERCENT PASSING	SPECS.

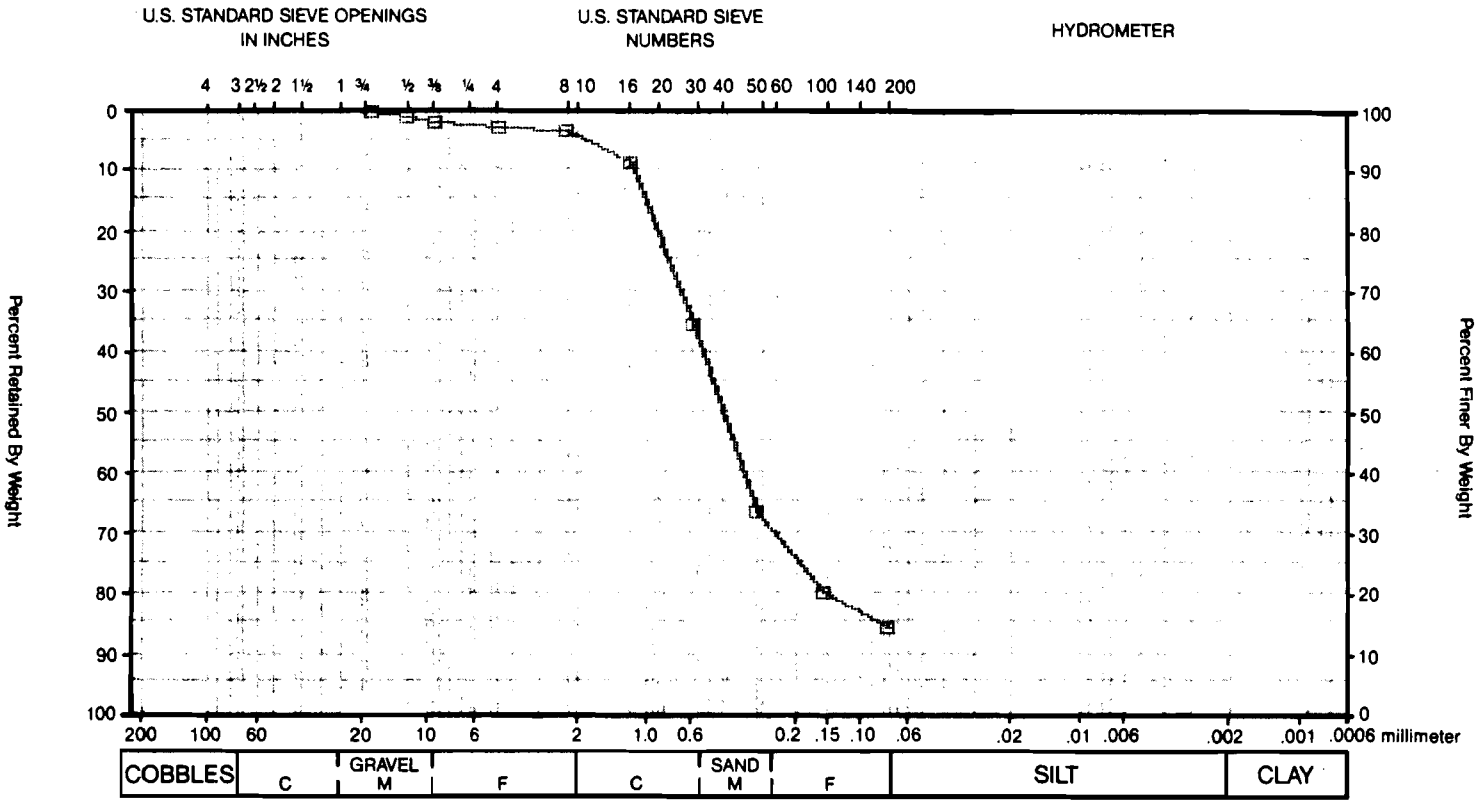
Pan = 11.11%
Wash Loss Was Not Tested.

SPECIFICATION: ASTM C 136
TEST STANDARD:
NOTES: ALL SAMPLES WERE TAKEN FROM A 3 inch O.D. SPLIT SPOON

Test Samples are retained for 30 days after submission and then discarded, unless other arrangements are made.

CLIENT: NYS DEC, GLADDING CORDAGE SITE
LAB NUMBER: 7-94-2/37537.002 DATE RECEIVED: 6/30/94
TEST BY: KASJ DATE TESTED: 7/1/94
REVIEWED BY: WSC DATE REPORTED: 7/6/94
SAMPLE DESCR: RW-2, 54-56 feet

GRAIN SIZE DISTRIBUTION



COARSE

SIZE (inches)	PERCENT RETAINED	CUMULATIVE PERCENT PASSING	SPECS.
3/4	0.00	100.00	
1/2	0.77	99.23	
3/8	0.97	98.26	

FINE

SIEVE	PERCENT RETAINED	CUMULATIVE PERCENT PASSING	SPECS.
4	0.82	97.44	
8	0.69	96.75	
16	5.24	91.52	
30	26.90	64.62	
50	31.42	33.20	
100	13.40	19.80	
200	5.57	14.23	

HYDROMETER

PARTICLE DIAMETER (mm)	PERCENT PASSING	SPECS.

Pan = 14.23%
Wash Loss Was Not Tested.

SPECIFICATION: ASTM C 136
TEST STANDARD:
NOTES: ALL SAMPLES WERE TAKEN FROM A 3 inch O.D. SPLIT SPOON

Test Samples are retained for 30 days after submission and then discarded, unless other arrangements are made.

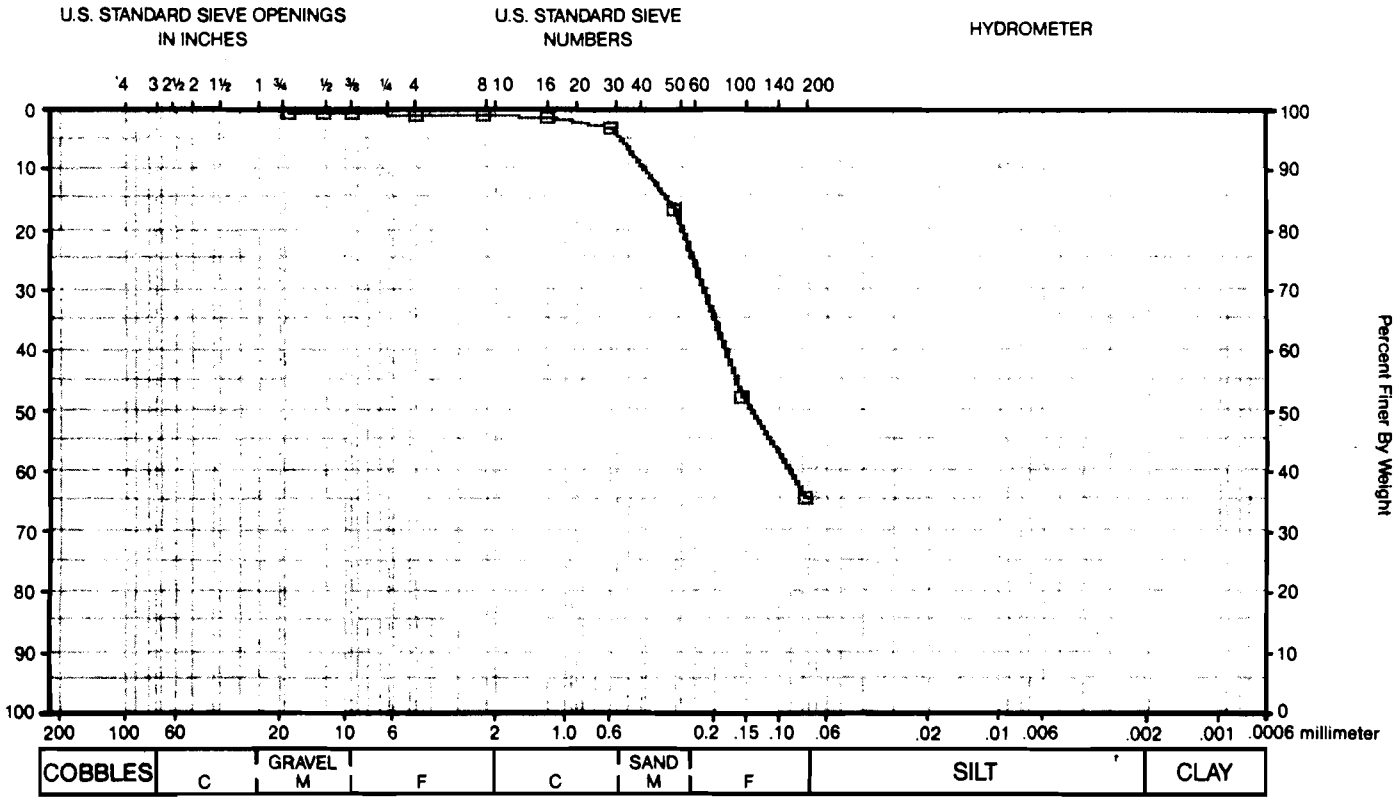
J6

RUST ENVIRONMENT & INFRASTRUCTURE

Formerly DUNN Corporation

CLIENT: NYS DEC, GLADDING CORDAGE SITE
LAB NUMBER: 7-94-14/37537.002 DATE RECEIVED: 7/6/94
TEST BY: REF DATE TESTED: 7/8/94
REVIEWED BY: WSC DATE REPORTED: 7/11/94
SAMPLE DESCR: RW-2, 56-58 feet

GRAIN SIZE DISTRIBUTION



COARSE

SIZE (Inches)	PERCENT RETAINED	CUMULATIVE PERCENT PASSING	SPECS.
3/4	0.00	100.00	
1/2	0.19	99.81	
3/8	0.00	99.81	

FINE

SIEVE	PERCENT RETAINED	CUMULATIVE PERCENT PASSING	SPECS.
4	0.21	99.60	
8	0.03	99.56	
16	0.33	99.24	
30	1.93	97.30	
50	13.92	83.39	
100	30.83	52.56	
200	17.20	35.36	

HYDROMETER

PARTICLE DIAMETER (mm)	PERCENT PASSING	SPECS.

Pan = 35.38%
Wash Loss Was Not Tested.

SPECIFICATION: ASTM C 136
TEST STANDARD:
NOTES: ALL SAMPLES WERE TAKEN FROM A 3 inch O.D. SPLIT SPOON

Test Samples are retained for 30 days after submission and then discarded, unless other arrangements are made.

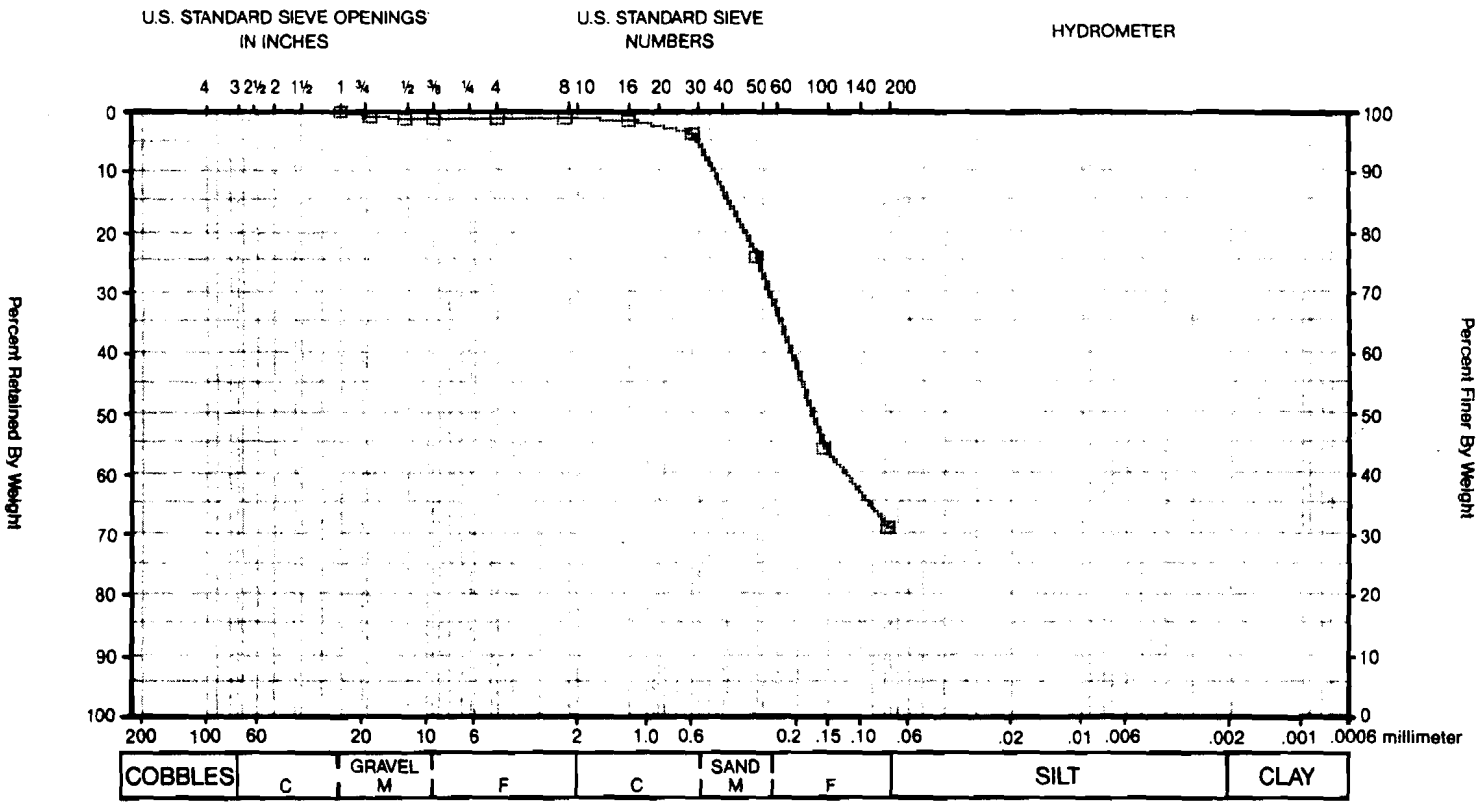
JG

RUST ENVIRONMENT & INFRASTRUCTURE

Formerly DUNN Corporation

CLIENT: NYS DEC, GLADDING CORDAGE SITE
LAB NUMBER: 7-94-3/37537.002 DATE RECEIVED: 6/30/94
TEST BY: KASJ DATE TESTED: 7/1/94
REVIEWED BY: WSC DATE REPORTED: 7/6/94
SAMPLE DESCR: RW-2, 58-60 feet

GRAIN SIZE DISTRIBUTION



COARSE

SIZE (inches)	PERCENT RETAINED	CUMULATIVE PERCENT PASSING	SPECS.
1	0.00	100.00	
3/4	1.04	98.96	
1/2	0.34	98.62	
3/8	0.00	98.62	

FINE

SIEVE	PERCENT RETAINED	CUMULATIVE PERCENT PASSING	SPECS.
4	0.00	98.62	
8	0.12	98.50	
16	0.39	98.11	
30	1.94	96.18	
50	20.56	75.62	
100	32.01	43.61	
200	13.07	30.54	

HYDROMETER

PARTICLE DIAMETER (mm)	PERCENT PASSING	SPECS.

Pan = 30.54%
Wash Loss Was Not Tested.

SPECIFICATION: ASTM C 136
TEST STANDARD:
NOTES: ALL SAMPLES WERE TAKEN FROM A 3 inch O.D. SPLIT SPOON

Test Samples are retained for 30 days after submission and then discarded, unless other arrangements are made.

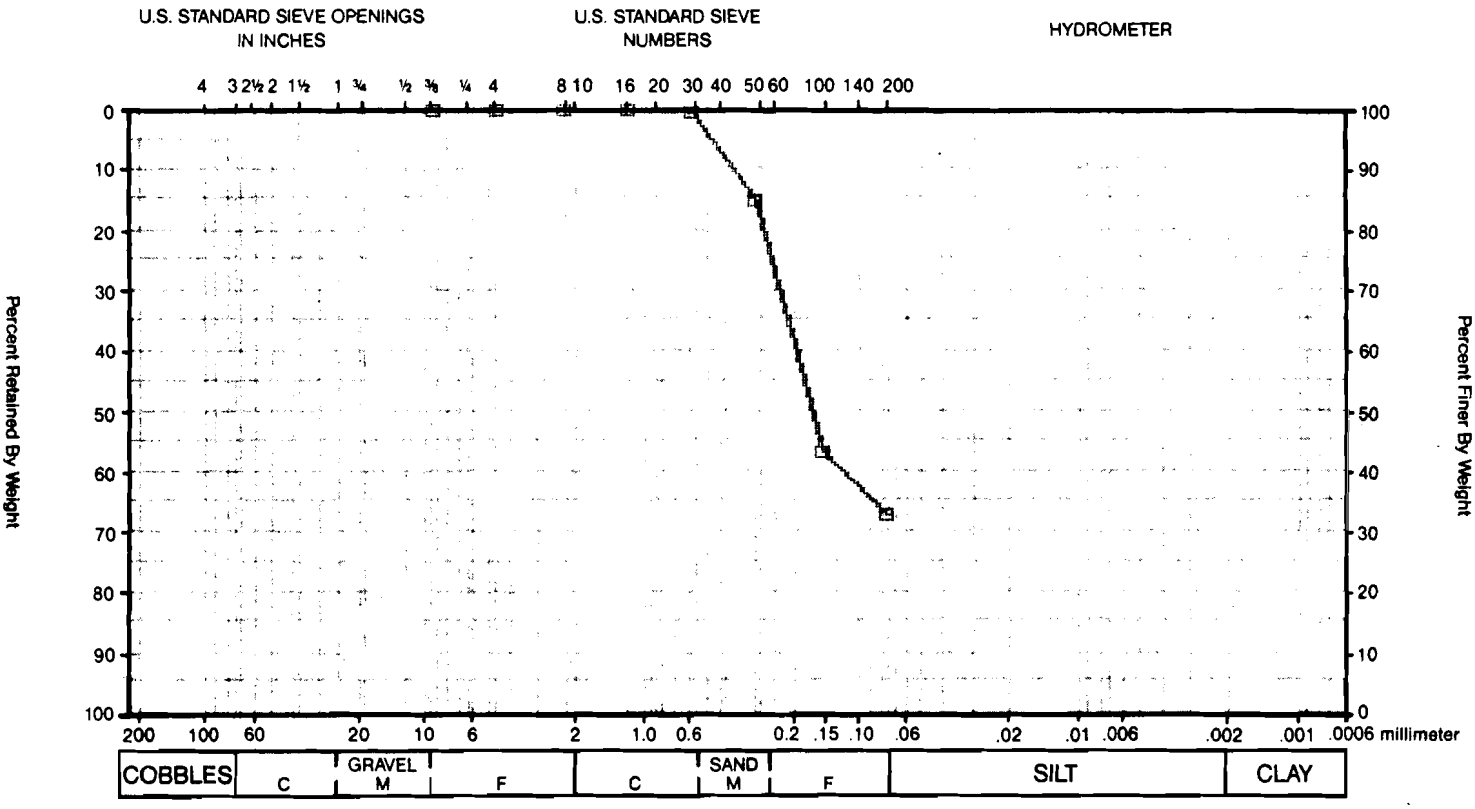
JG

RUST ENVIRONMENT & INFRASTRUCTURE

Formerly DUNN Corporation

CLIENT: NYS DEC, GLADDING CORDAGE SITE
LAB NUMBER: 7-94-4/37537.002 DATE RECEIVED: 6/30/94
TEST BY: REF DATE TESTED: 7/1/94
REVIEWED BY: WSC DATE REPORTED: 7/6/94
SAMPLE DESCR: RW-2, 60-62 feet

GRAIN SIZE DISTRIBUTION



COARSE

SIZE (inches)	PERCENT RETAINED	CUMULATIVE PERCENT PASSING	SPECS.
3/8	0.00	100.00	

FINE

SIEVE	PERCENT RETAINED	CUMULATIVE PERCENT PASSING	SPECS.
4	0.02	99.98	
8	0.07	99.92	
16	0.05	99.87	
30	0.37	99.49	
50	14.43	85.07	
100	41.98	43.09	
200	10.75	32.34	

HYDROMETER

PARTICLE DIAMETER (mm)	PERCENT PASSING	SPECS.

Pan = 32.34%
Wash Loss Was Not Tested.

SPECIFICATION: ASTM C 136
TEST STANDARD:
NOTES: ALL SAMPLES WERE TAKEN FROM A 3 inch O.D. SPLIT SPOON

Test Samples are retained for 30 days after submission and then discarded, unless other arrangements are made.

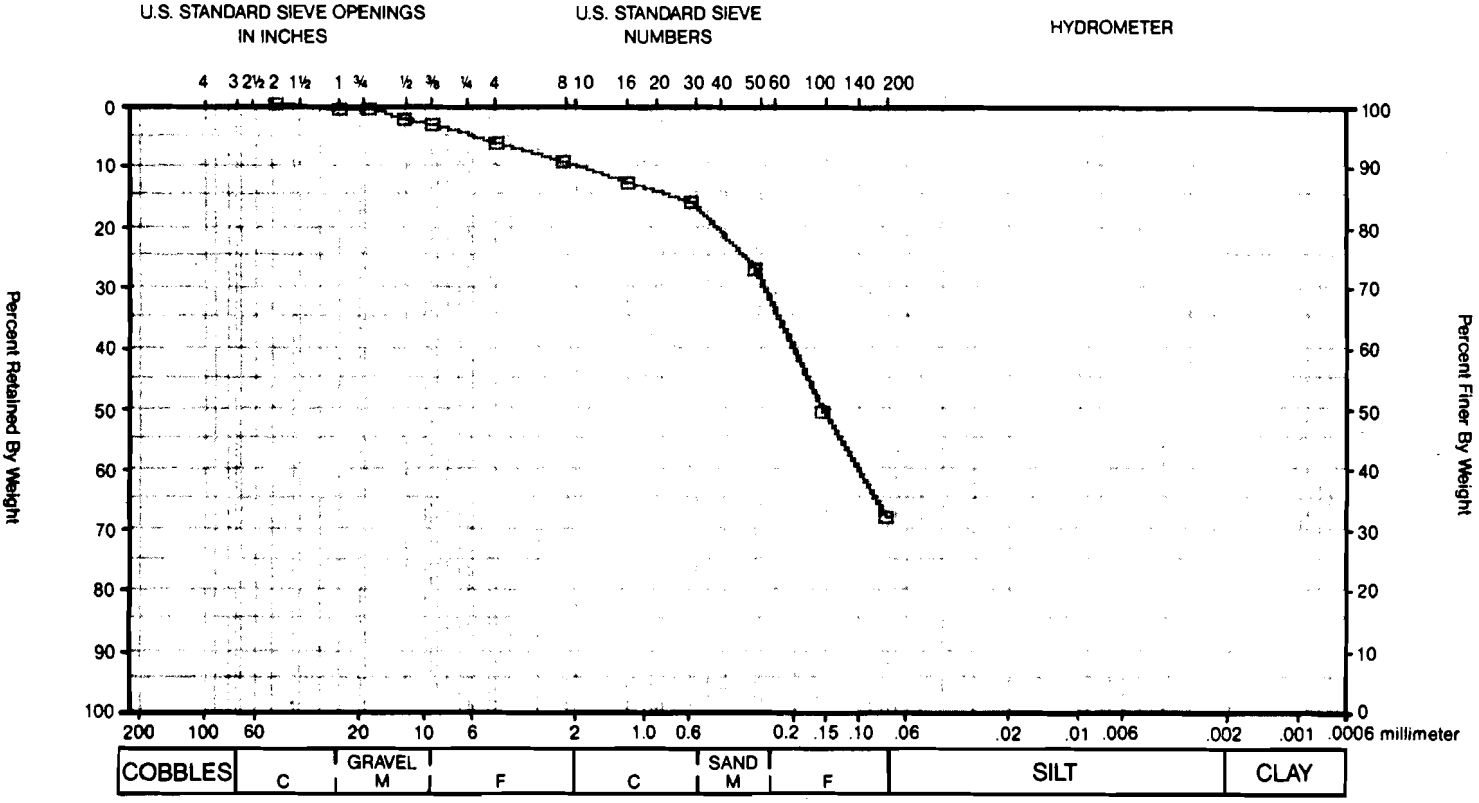
JG

RUST ENVIRONMENT & INFRASTRUCTURE

Formerly DUNN Corporation

CLIENT: NYS DEC, GLADDING CORDAGE SITE
LAB NUMBER: 7-94-15/37537.002 DATE RECEIVED: 7/6/94
TEST BY: REF DATE TESTED: 7/8/94
REVIEWED BY: WSC DATE REPORTED: 7/11/94
SAMPLE DESCR: RW-2, 62-64 feet

GRAIN SIZE DISTRIBUTION



COARSE

SIZE (inches)	PERCENT RETAINED	CUMULATIVE PERCENT PASSING	SPECS.
2	0.00	100.00	
1	0.98	99.02	
3/4	0.00	99.02	
1/2	1.50	97.52	
3/8	1.02	96.50	

FINE

SIEVE	PERCENT RETAINED	CUMULATIVE PERCENT PASSING	SPECS.
4	2.98	93.53	
8	3.28	90.25	
16	3.47	86.78	
30	3.32	83.46	
50	11.17	72.29	
100	23.49	48.80	
200	17.33	31.47	

HYDROMETER

PARTICLE DIAMETER (mm)	PERCENT PASSING	SPECS.

Pan = 31.47%
Wash Loss Was Not Tested.

SPECIFICATION: ASTM C 136
TEST STANDARD:
NOTES: ALL SAMPLES WERE TAKEN FROM A 3 inch O.D. SPLIT SPOON

Test Samples are retained for 30 days after submission and then discarded, unless other arrangements are made.

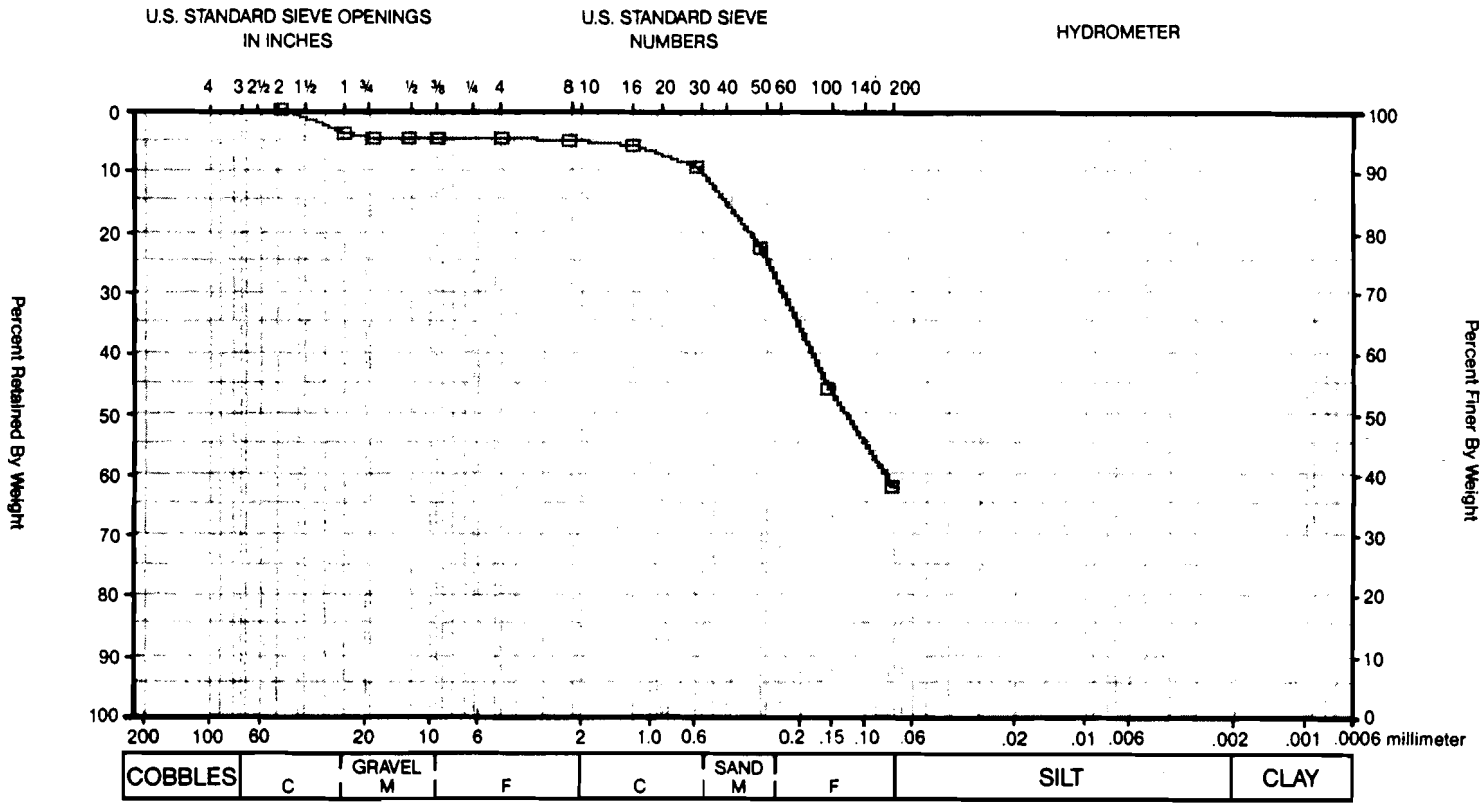
J6

RUST ENVIRONMENT & INFRASTRUCTURE

Formerly DUNN Corporation

CLIENT: NYS DEC, GLADDING CORDAGE SITE
LAB NUMBER: 7-94-16/37537.002 DATE RECEIVED: 7/6/94
TEST BY: REF DATE TESTED: 7/8/94
REVIEWED BY: WSC DATE REPORTED: 7/11/94
SAMPLE DESCR: RW-2, 64-66 feet

GRAIN SIZE DISTRIBUTION



COARSE

SIZE (inches)	PERCENT RETAINED	CUMULATIVE PERCENT PASSING	SPECS.
2	0.00	100.00	
1	4.12	95.88	
3/4	0.62	95.25	
1/2	0.00	95.25	
3/8	0.04	95.21	

FINE

SIEVE	PERCENT RETAINED	CUMULATIVE PERCENT PASSING	SPECS.
4	0.14	95.07	
8	0.20	94.87	
16	0.88	93.99	
30	3.82	90.18	
50	13.39	76.79	
100	23.28	53.51	
200	15.99	37.52	

HYDROMETER

PARTICLE DIAMETER (mm)	PERCENT PASSING	SPECS.

Pan = 37.52%
Wash Loss Was Not Tested.

SPECIFICATION: ASTM C 136
TEST STANDARD:
NOTES: ALL SAMPLES WERE TAKEN FROM A 3 inch O.D. SPLIT SPOON

Test Samples are retained for 30 days after submission and then discarded, unless other arrangements are made.

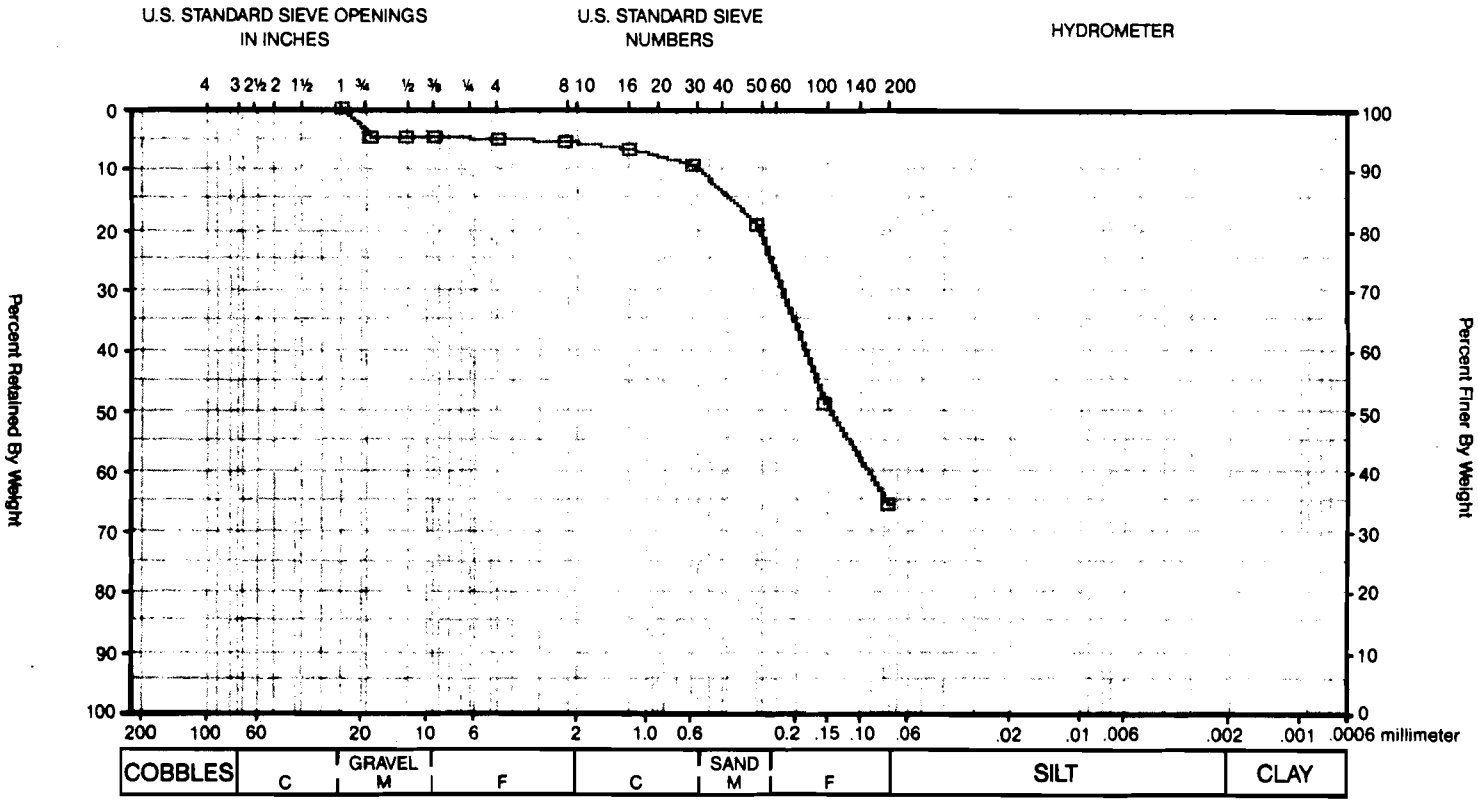
J6

RUST ENVIRONMENT & INFRASTRUCTURE

Formerly DUNN Corporation

CLIENT: NYS DEC, GLADDING CORDAGE SITE
LAB NUMBER: 7-94-17/37537.002 DATE RECEIVED: 7/6/94
TEST BY: REF DATE TESTED: 7/8/94
REVIEWED BY: WSC DATE REPORTED: 7/11/94
SAMPLE DESCR: RW-2, 66 - 66.8 feet

GRAIN SIZE DISTRIBUTION



COARSE

SIZE (inches)	PERCENT RETAINED	CUMULATIVE PERCENT PASSING	SPECS.
1	0.00	100.00	
3/4	5.05	94.95	
1/2	0.00	94.95	
3/8	0.00	94.95	

FINE

SIEVE	PERCENT RETAINED	CUMULATIVE PERCENT PASSING	SPECS.
4	0.17	94.79	
8	0.75	94.04	
16	1.31	92.73	
30	2.48	90.25	
50	9.71	80.54	
100	30.01	50.53	
200	16.12	34.40	

HYDROMETER

PARTICLE DIAMETER (mm)	PERCENT PASSING	SPECS.

Pan = 34.40%
Wash Loss Was Not Tested.

SPECIFICATION: ASTM C 136
TEST STANDARD:
NOTES: ALL SAMPLES WERE TAKEN FROM A 3 inch O.D. SPLIT SPOON

Test Samples are retained for 30 days after submission and then discarded, unless other arrangements are made.

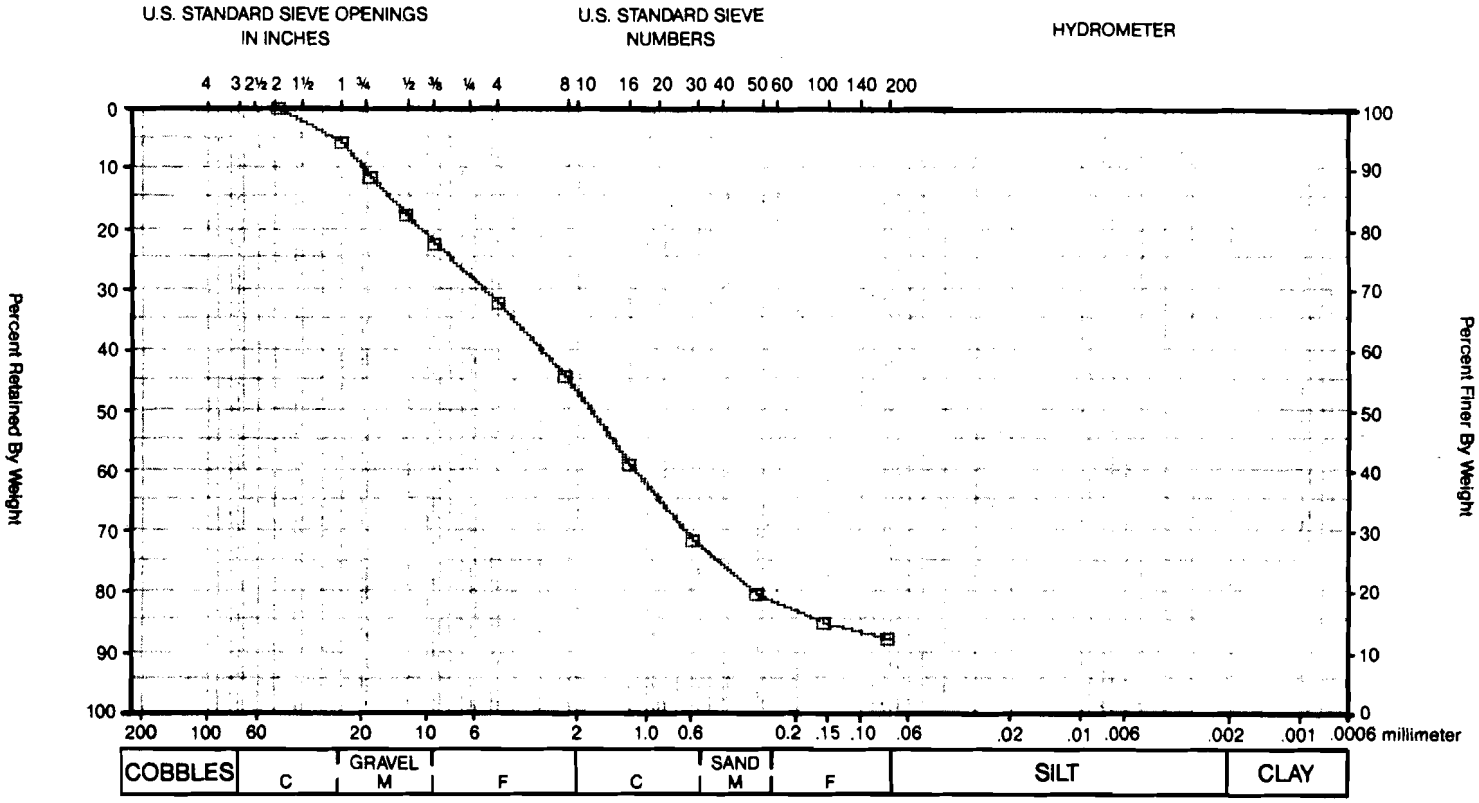
J6

RUST ENVIRONMENT & INFRASTRUCTURE

Formerly DUNN Corporation

CLIENT: NYS DEC, GLADDING CORDAGE SITE
LAB NUMBER: 7-94-5/37537.002 DATE RECEIVED: 6/30/94
TEST BY: KASJ DATE TESTED: 7/1/94
REVIEWED BY: WSC DATE REPORTED: 7/6/94
SAMPLE DESCR: RW-2, 66.8-68.0 feet

GRAIN SIZE DISTRIBUTION



COARSE

SIZE (inches)	PERCENT RETAINED	CUMULATIVE PERCENT PASSING	SPECS.
2	0.00	100.00	
1	5.97	94.03	
3/4	5.75	88.28	
1/2	5.84	82.44	
3/8	4.97	77.47	

FINE

SIEVE	PERCENT RETAINED	CUMULATIVE PERCENT PASSING	SPECS.
4	10.07	67.39	
8	12.43	54.97	
16	14.54	40.43	
30	12.50	27.92	
50	8.64	19.28	
100	4.96	14.32	
200	2.73	11.60	

HYDROMETER

PARTICLE DIAMETER (mm)	PERCENT PASSING	SPECS.

Pan = 11.59%
Wash Loss Was Not Tested.

SPECIFICATION: ASTM C 136
TEST STANDARD:
NOTES: ALL BAG SAMPLES WERE TAKEN FROM A 3 inch O.D. SPLIT SPOON

Test Samples are retained for 30 days after submission and then discarded, unless other arrangements are made.

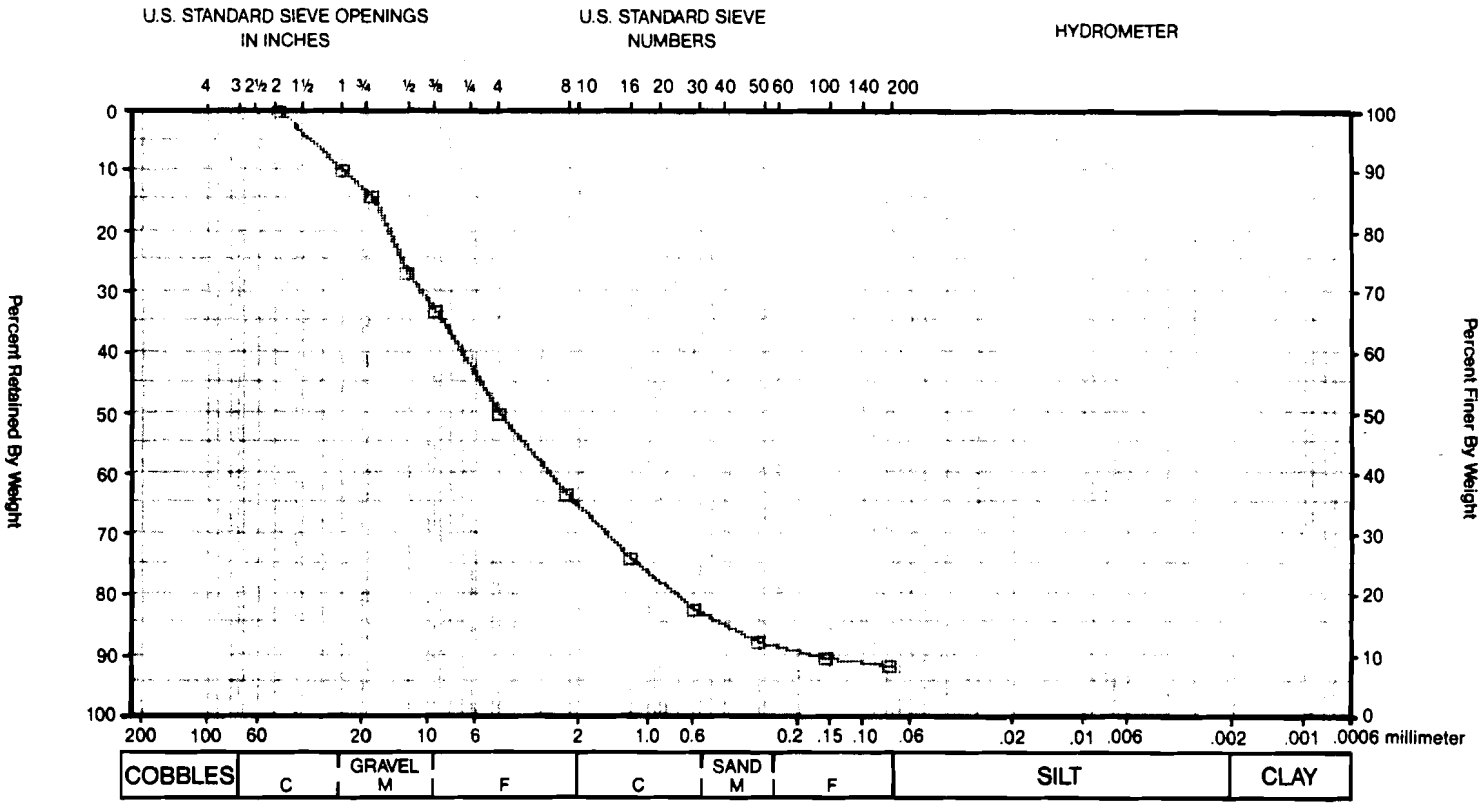
JG

RUST ENVIRONMENT & INFRASTRUCTURE

Formerly DUNN Corporation

CLIENT: NYS DEC, GLADDING CORDAGE SITE
LAB NUMBER: 7-94-6/37537.002 DATE RECEIVED: 6/30/94
TEST BY: HASJ DATE TESTED: 7/1/94
REVIEWED BY: WSC DATE REPORTED: 7/6/94
SAMPLE DESCR: RW-2, 68-70 feet

GRAIN SIZE DISTRIBUTION



COARSE

SIZE (inches)	PERCENT RETAINED	CUMULATIVE PERCENT PASSING	SPECS.
2	0.00	100.00	
1	9.83	90.17	
3/4	4.43	85.73	
1/2	12.71	73.03	
3/8	6.15	66.88	

FINE

SIEVE	PERCENT RETAINED	CUMULATIVE PERCENT PASSING	SPECS.
4	17.16	49.72	
8	13.14	36.58	
16	10.91	25.67	
30	8.31	17.37	
50	5.58	11.79	
100	2.31	9.48	
200	1.30	8.19	

HYDROMETER

PARTICLE DIAMETER (mm)	PERCENT PASSING	SPECS.

Pan = 8.19%
Wash Loss Was Not Tested.

SPECIFICATION: ASTM C 136
TEST STANDARD:
NOTES: ALL SAMPLES WERE TAKEN FROM A 3 inch O.D. SPLIT SPOON

Test Samples are retained for 30 days after submission and then discarded, unless other arrangements are made.

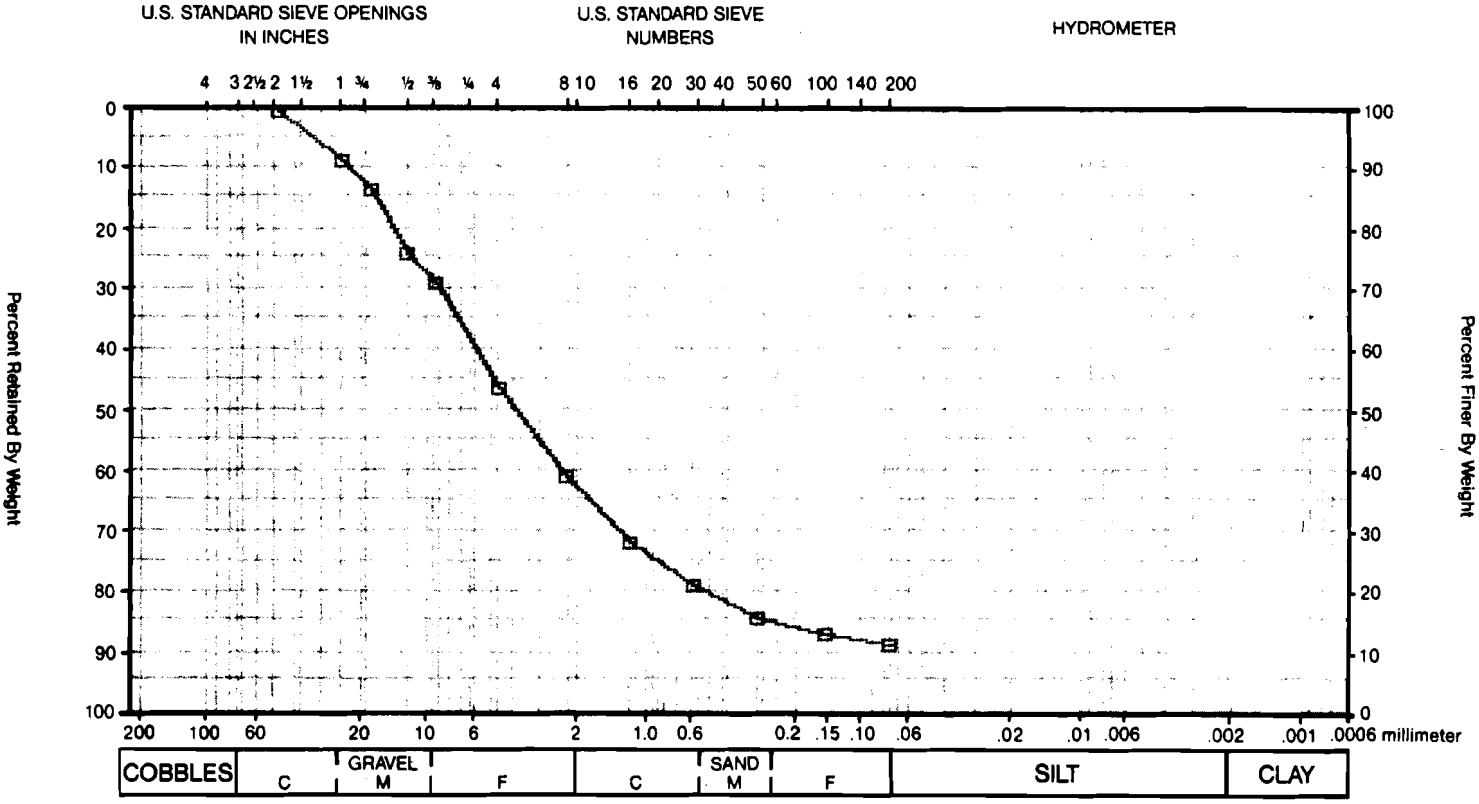
JG

RUST ENVIRONMENT & INFRASTRUCTURE

Formerly DUNN Corporation

CLIENT: NYS DEC, GLADDING CORDAGE SITE
LAB NUMBER: 7-94-18/37537.002 DATE RECEIVED: 7/6/94
TEST BY: REF DATE TESTED: 7/8/94
REVIEWED BY: WSC DATE REPORTED: 7/11/94
SAMPLE DESCR: RW-2, 70-72 feet

GRAIN SIZE DISTRIBUTION



COARSE

SIZE (inches)	PERCENT RETAINED	CUMULATIVE PERCENT PASSING	SPECS.
2	0.00	100.00	
1	8.21	91.79	
3/4	4.75	87.04	
1/2	10.71	76.33	
3/8	4.78	71.55	

FINE

SIEVE	PERCENT RETAINED	CUMULATIVE PERCENT PASSING	SPECS.
4	17.19	54.36	
8	14.76	39.59	
16	11.01	28.59	
30	7.11	21.48	
50	5.34	16.14	
100	2.88	13.26	
200	1.85	11.41	

HYDROMETER

PARTICLE DIAMETER (mm)	PERCENT PASSING	SPECS.

Pan = 11.41%
Wash Loss Was Not Tested.

SPECIFICATION: ASTM C 136
TEST STANDARD:
NOTES: ALL SAMPLES WERE TAKEN FROM A 3 inch O.D. SPLIT SPOON

Test Samples are retained for 30 days after submission and then discarded, unless other arrangements are made.

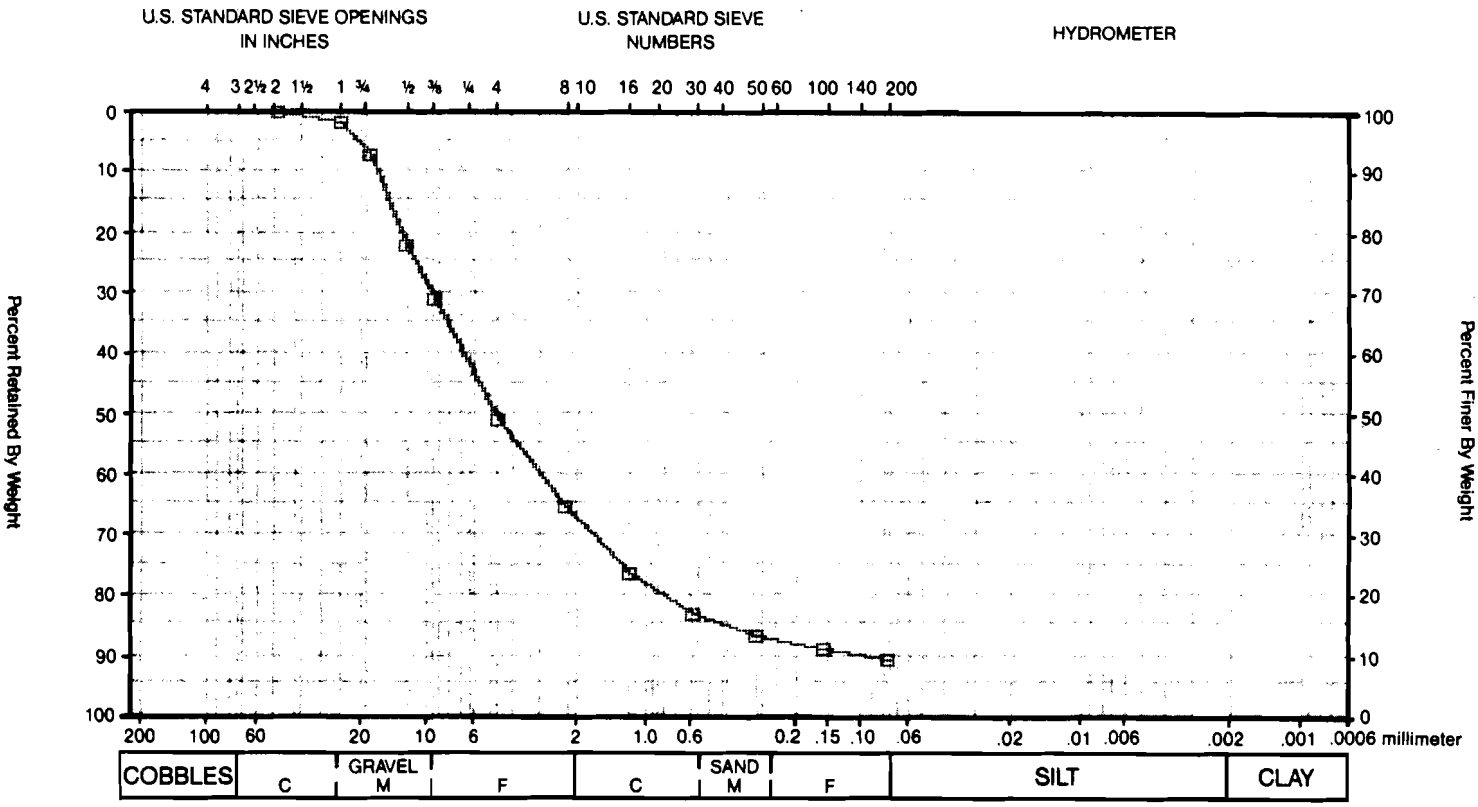
J6

RUST ENVIRONMENT & INFRASTRUCTURE

Formerly DUNN Corporation

CLIENT: NYS DEC, GLADDING CORDAGE SITE
LAB NUMBER: 7-94-7/37537.002 DATE RECEIVED: 6/30/94
TEST BY: KASJ DATE TESTED: 7/1/94
REVIEWED BY: WSC DATE REPORTED: 7/6/94
SAMPLE DESCR: RW-2, 72-74 feet

GRAIN SIZE DISTRIBUTION



COARSE

SIZE (inches)	PERCENT RETAINED	CUMULATIVE PERCENT PASSING	SPECS.
2	0.00	100.00	
1	1.88	98.12	
3/4	5.31	92.80	
1/2	14.98	77.83	
3/8	8.89	68.93	

FINE

SIEVE	PERCENT RETAINED	CUMULATIVE PERCENT PASSING	SPECS.
4	19.89	49.04	
8	14.66	34.38	
16	11.30	23.08	
30	6.68	16.40	
50	3.71	12.69	
100	2.01	10.68	
200	1.57	9.11	

HYDROMETER

PARTICLE DIAMETER (mm)	PERCENT PASSING	SPECS.

Pan = 9.11%
Wash Loss Was Not Tested.

SPECIFICATION: ASTM C 136
TEST STANDARD:
NOTES: ALL SAMPLES WERE TAKEN FROM A 3 inch O.D. SPLIT SPOON

Test Samples are retained for 30 days after submission and then discarded, unless other arrangements are made.

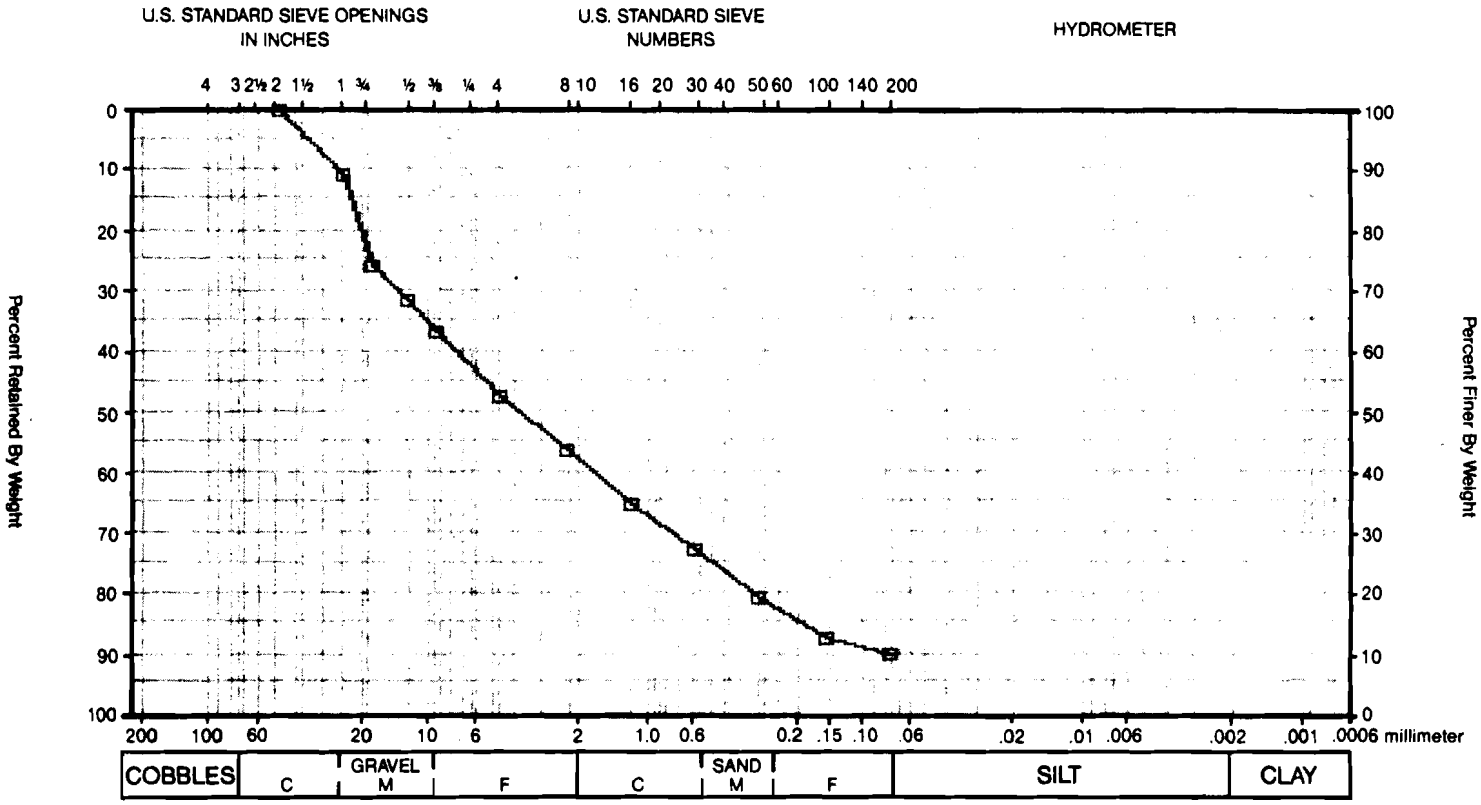
J6

RUST ENVIRONMENT & INFRASTRUCTURE

Formerly DUNN Corporation

CLIENT: NYS DEC, GLADDING CORDAGE SITE
LAB NUMBER: 7-94-19/37537.002 DATE RECEIVED: 7/6/94
TEST BY: REF DATE TESTED: 7/8/94
REVIEWED BY: WSC DATE REPORTED: 7/11/94
SAMPLE DESCR: RW-2, 74-76 feet

GRAIN SIZE DISTRIBUTION



COARSE

SIZE (inches)	PERCENT RETAINED	CUMULATIVE PERCENT PASSING	SPECS.
2	0.00	100.00	
1	10.55	89.45	
3/4	15.16	74.29	
1/2	5.82	68.46	
3/8	5.27	63.19	

FINE

SIEVE	PERCENT RETAINED	CUMULATIVE PERCENT PASSING	SPECS.
4	10.62	52.58	
8	8.81	43.77	
16	9.32	34.46	
30	7.29	27.17	
50	8.16	19.00	
100	6.62	12.38	
200	2.51	9.87	

HYDROMETER

PARTICLE DIAMETER (mm)	PERCENT PASSING	SPECS.

Pan = 9.87%
Wash Loss Was Not Tested.

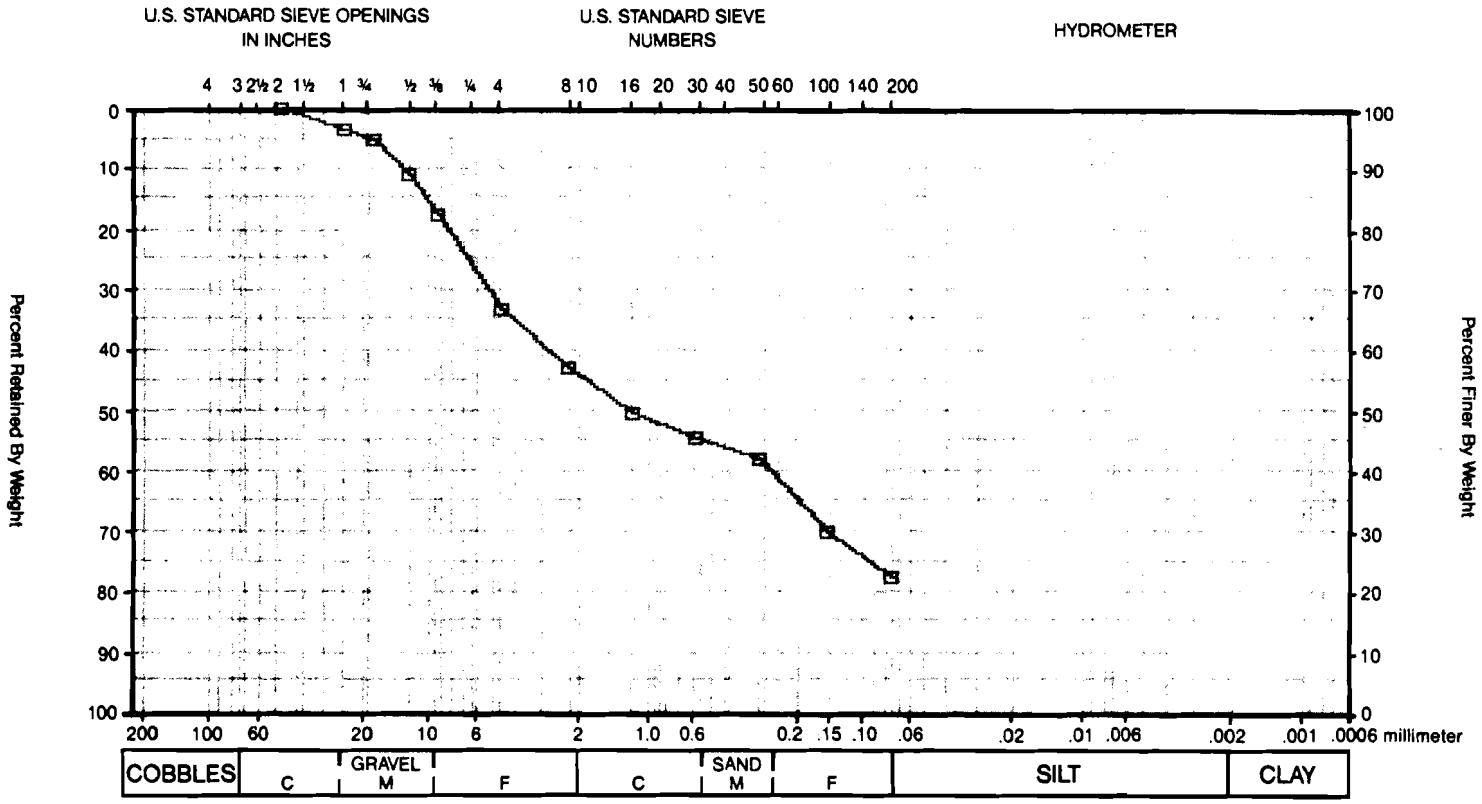
SPECIFICATION: ASTM C 136
TEST STANDARD:
NOTES: ALL SAMPLES WERE TAKEN FROM A 3 inch O.D. SPLIT SPOON

Test Samples are retained for 30 days after submission and then discarded, unless other arrangements are made.

JG

CLIENT: NYS DEC, GLADDING CORDAGE SITE
LAB NUMBER: 7-94-20/37537.002 DATE RECEIVED: 7/6/94
TEST BY: REF DATE TESTED: 7/8/94
REVIEWED BY: WSC DATE REPORTED: 7/11/94
SAMPLE DESCR: RW-2, 76-78 feet

GRAIN SIZE DISTRIBUTION



COARSE

SIZE (inches)	PERCENT RETAINED	CUMULATIVE PERCENT PASSING	SPECS.
2	0.00	100.00	
1	3.33	96.67	
3/4	1.96	94.71	
1/2	5.85	88.86	
3/8	6.53	82.33	

FINE

SIEVE	PERCENT RETAINED	CUMULATIVE PERCENT PASSING	SPECS.
4	15.51	66.82	
8	10.05	56.77	
16	7.33	49.45	
30	4.21	45.24	
50	3.42	41.82	
100	12.24	29.58	
200	7.24	22.34	

HYDROMETER

PARTICLE DIAMETER (mm)	PERCENT PASSING	SPECS.

Pan = 22.34%
Wash Loss Was Not Tested.

SPECIFICATION: ASTM C 136
TEST STANDARD:
NOTES: ALL SAMPLES WERE TAKEN FROM A 3 inch O.D. SPLIT SPOON

Test Samples are retained for 30 days after submission and then discarded, unless other arrangements are made.

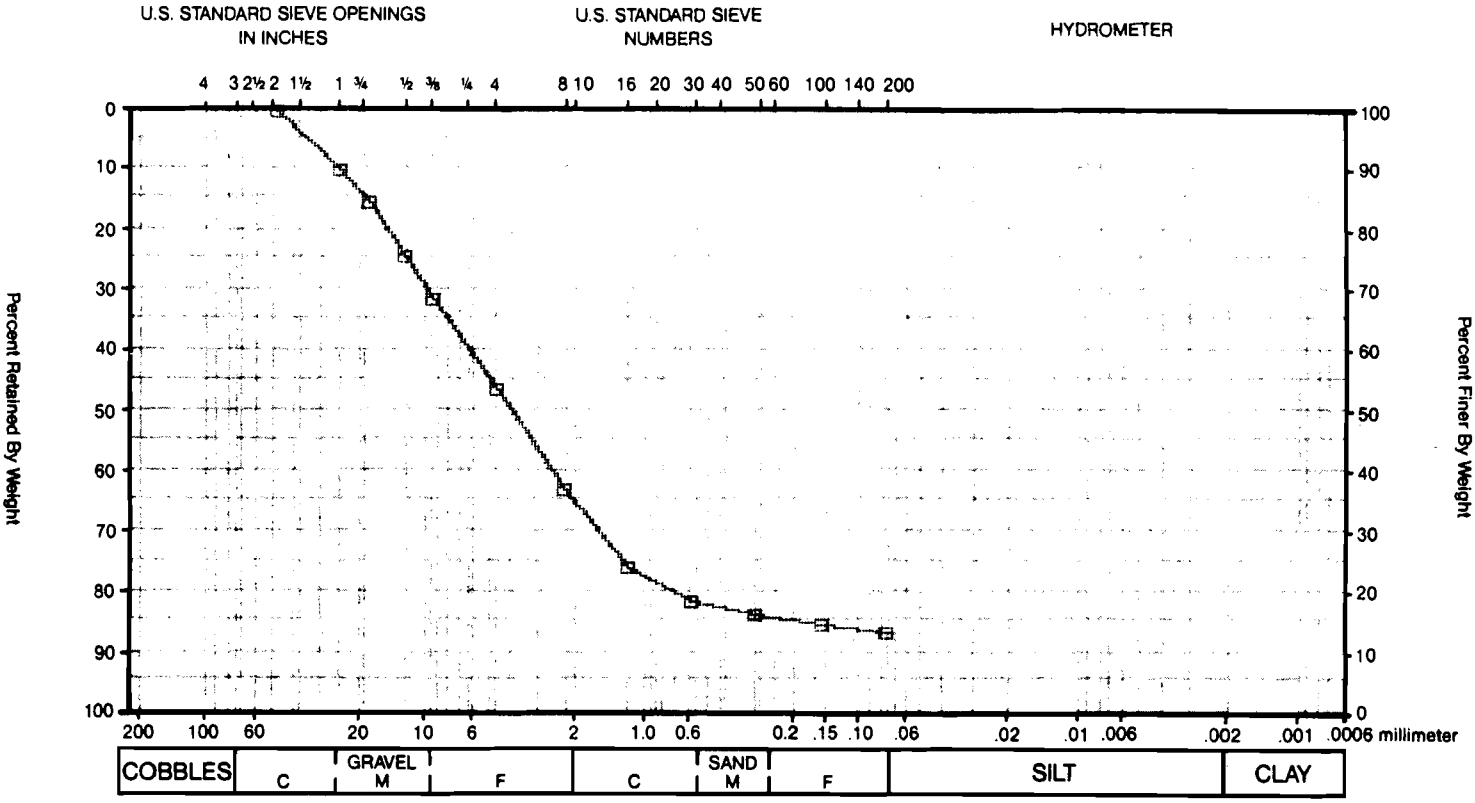
JG

RUST ENVIRONMENT & INFRASTRUCTURE

Formerly DUNN Corporation

CLIENT: NYS DEC, GLADDING CORDAGE SITE
LAB NUMBER: 7-94-8/37537.002 DATE RECEIVED: 6/30/94
TEST BY: REF DATE TESTED: 7/1/94
REVIEWED BY: WSC DATE REPORTED: 7/6/94
SAMPLE DESCR: RW-2, 78-80 feet

GRAIN SIZE DISTRIBUTION



COARSE

SIZE (Inches)	PERCENT RETAINED	CUMULATIVE PERCENT PASSING	SPECS.
2	0.00	100.00	
1	9.63	90.37	
3/4	5.34	85.03	
1/2	9.20	75.83	
3/8	6.91	68.92	

FINE

SIEVE	PERCENT RETAINED	CUMULATIVE PERCENT PASSING	SPECS.
4	15.16	53.76	
8	16.64	37.12	
16	12.82	24.30	
30	5.58	18.72	
50	2.48	16.24	
100	1.51	14.73	
200	1.22	13.51	

HYDROMETER

PARTICLE DIAMETER (mm)	PERCENT PASSING	SPECS.

Pan = 13.51%
Wash Loss Was Not Tested.

SPECIFICATION: ASTM C 136
TEST STANDARD:
NOTES: ALL SAMPLES WERE TAKEN FROM A 3 inch O.D. SPLIT SPOON

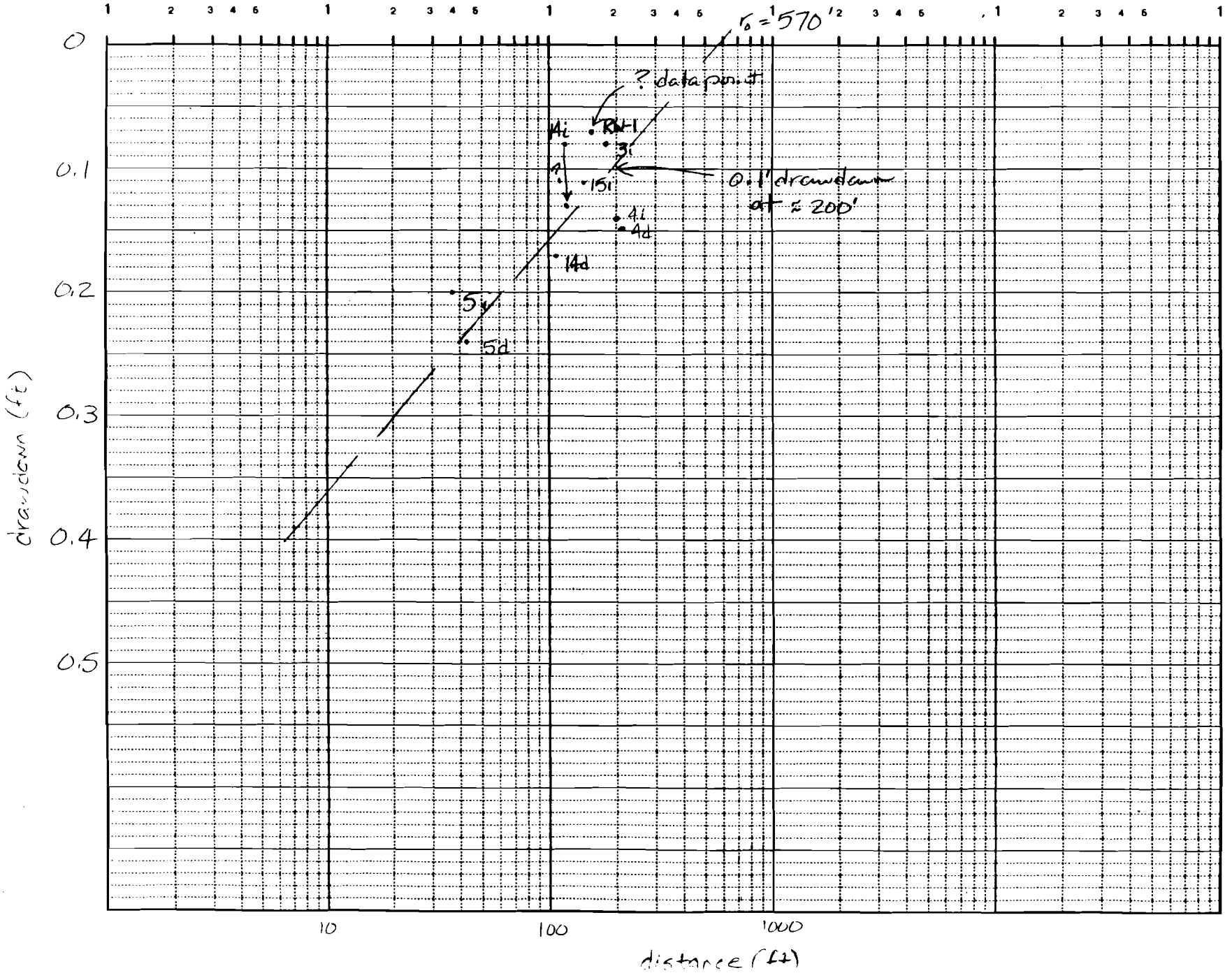
Test Samples are retained for 30 days after submission and then discarded, unless other arrangements are made.

J6

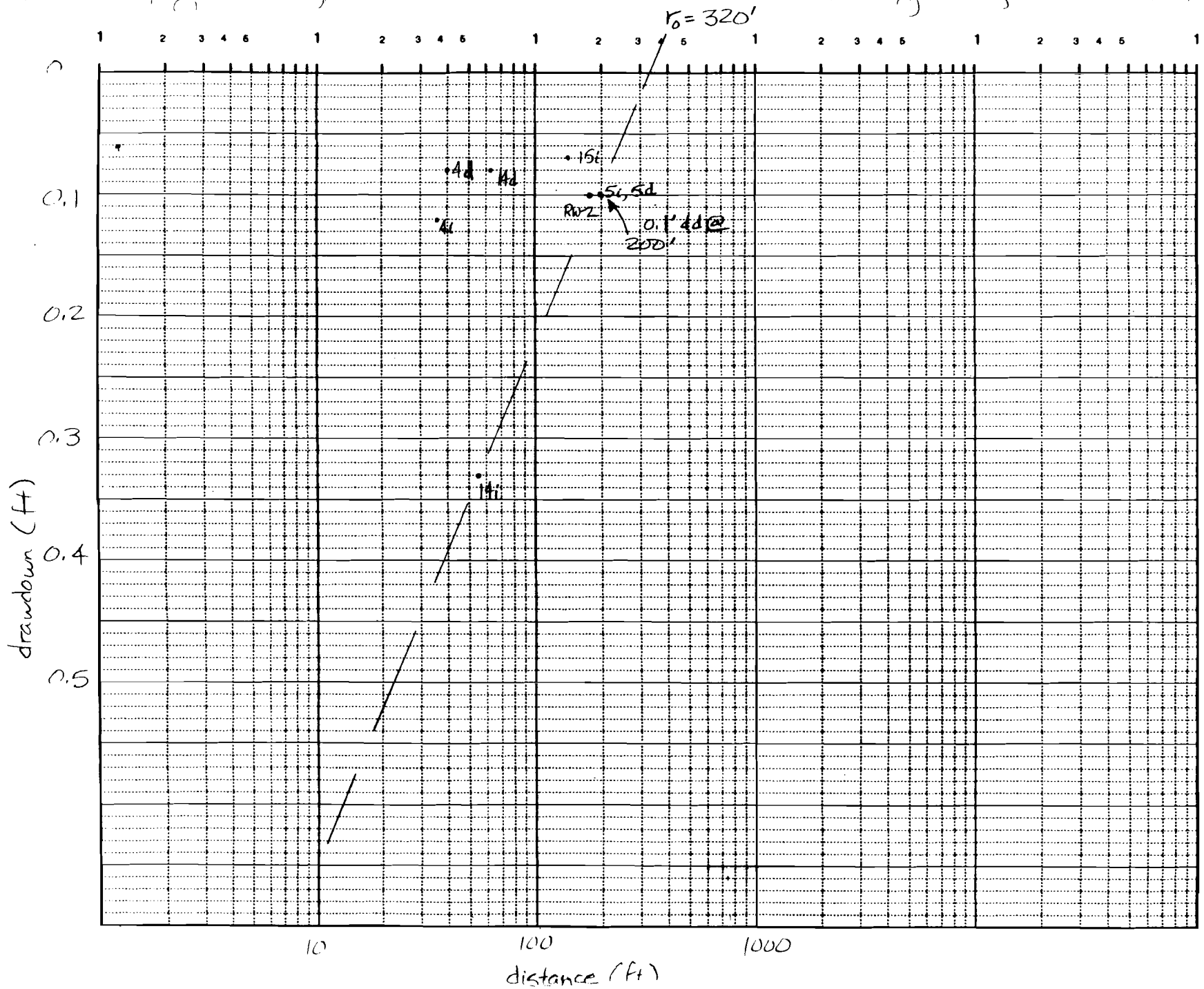
APPENDIX H

DISTANCE-DRAWDOWN GRAPHS
30 gpm STEP RATE TEST

RW-2 Pumping at 30 gpm for 100 minutes — Gladding, Cardage — 9/24/94

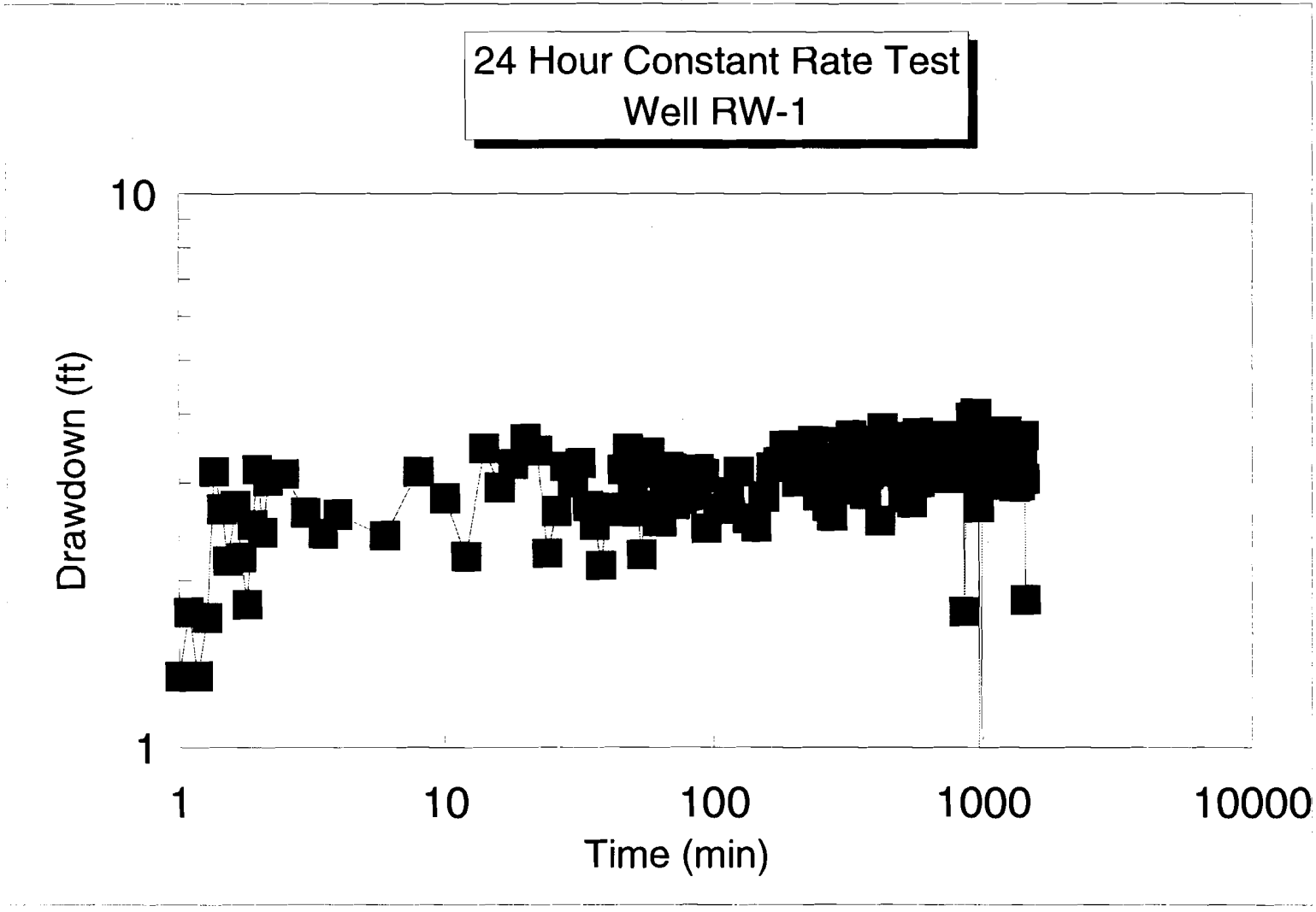


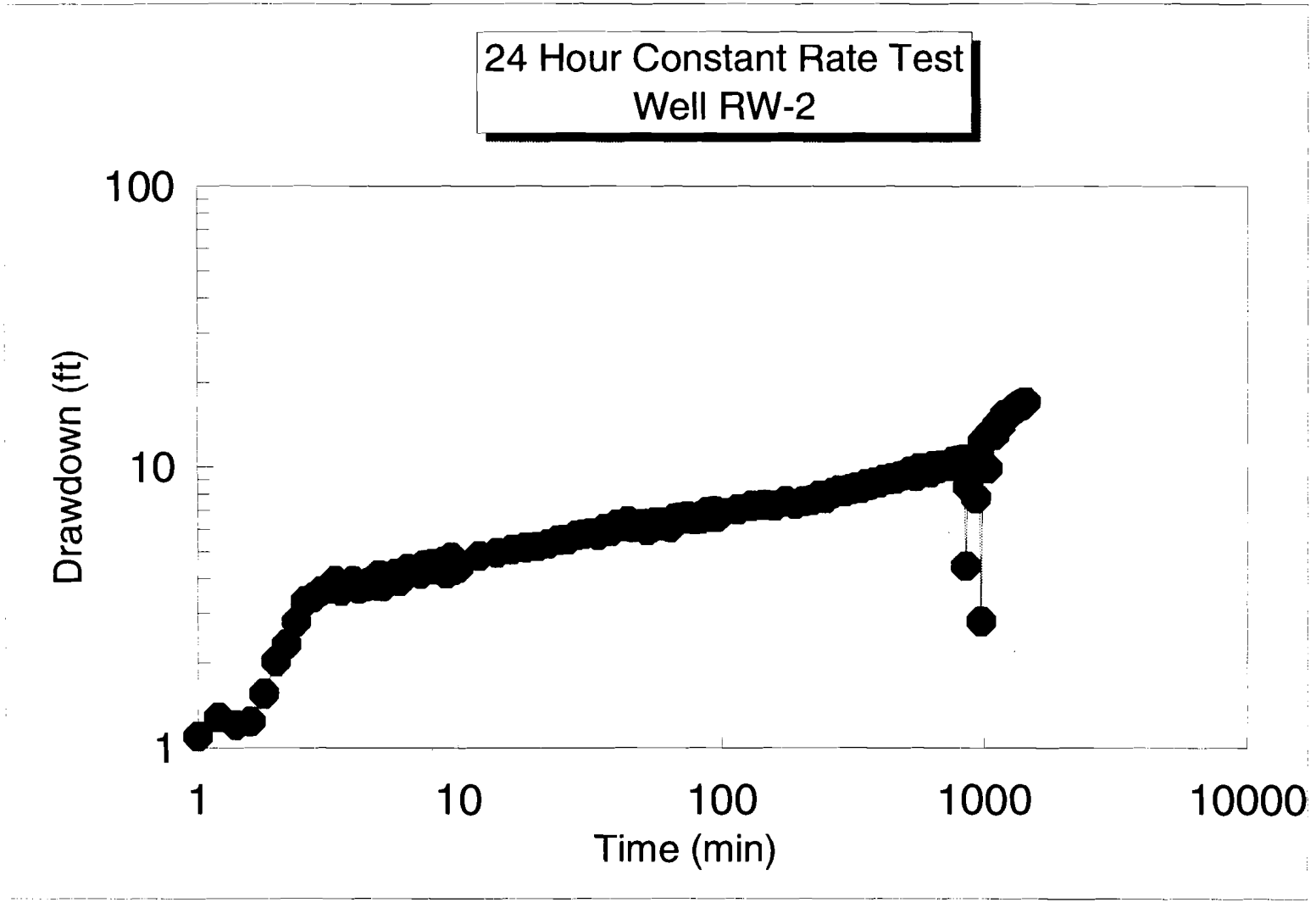
RW-1 Pumping at 50 gpm for 100 minutes — Gridding Cordage — 9/24/94

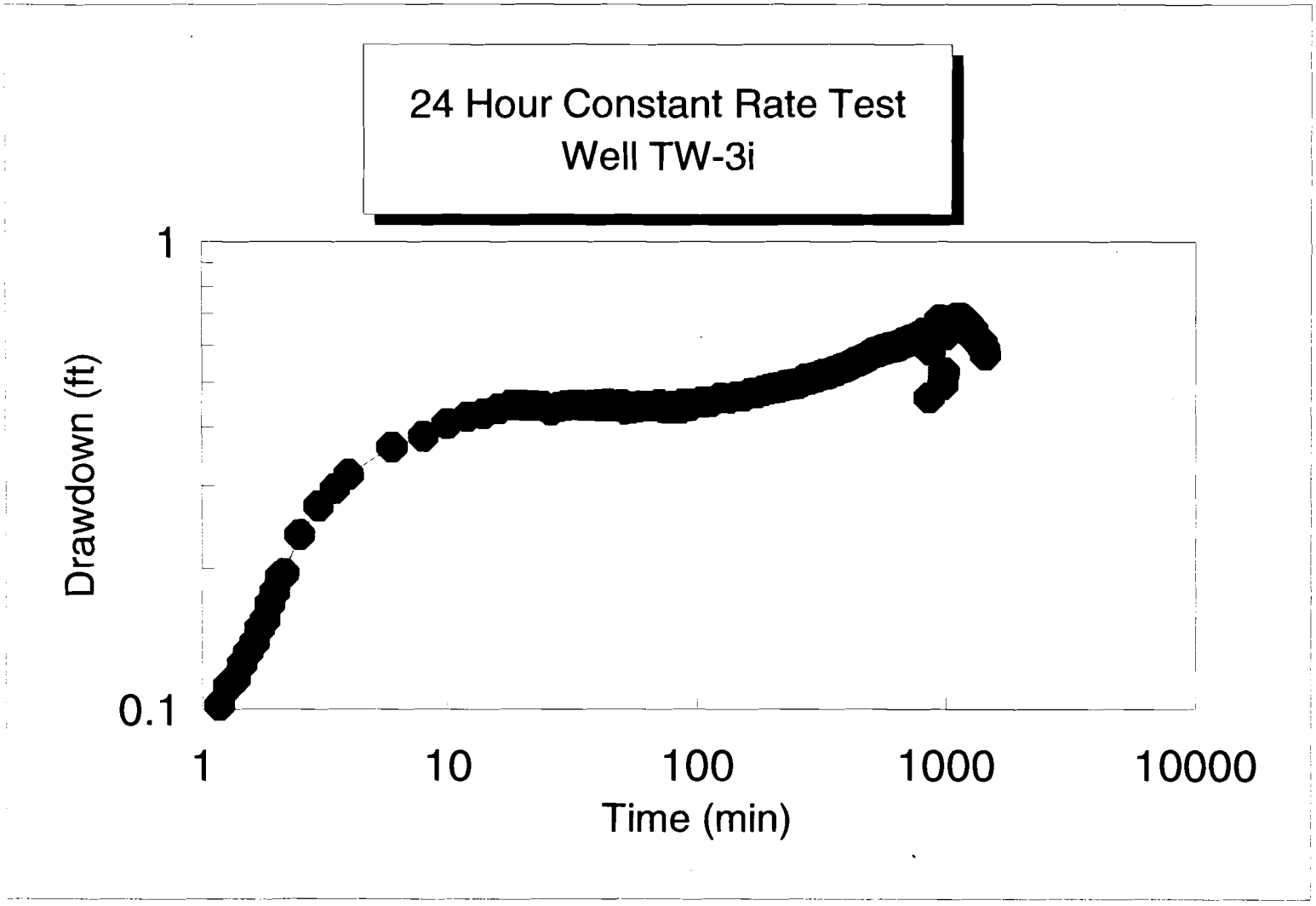


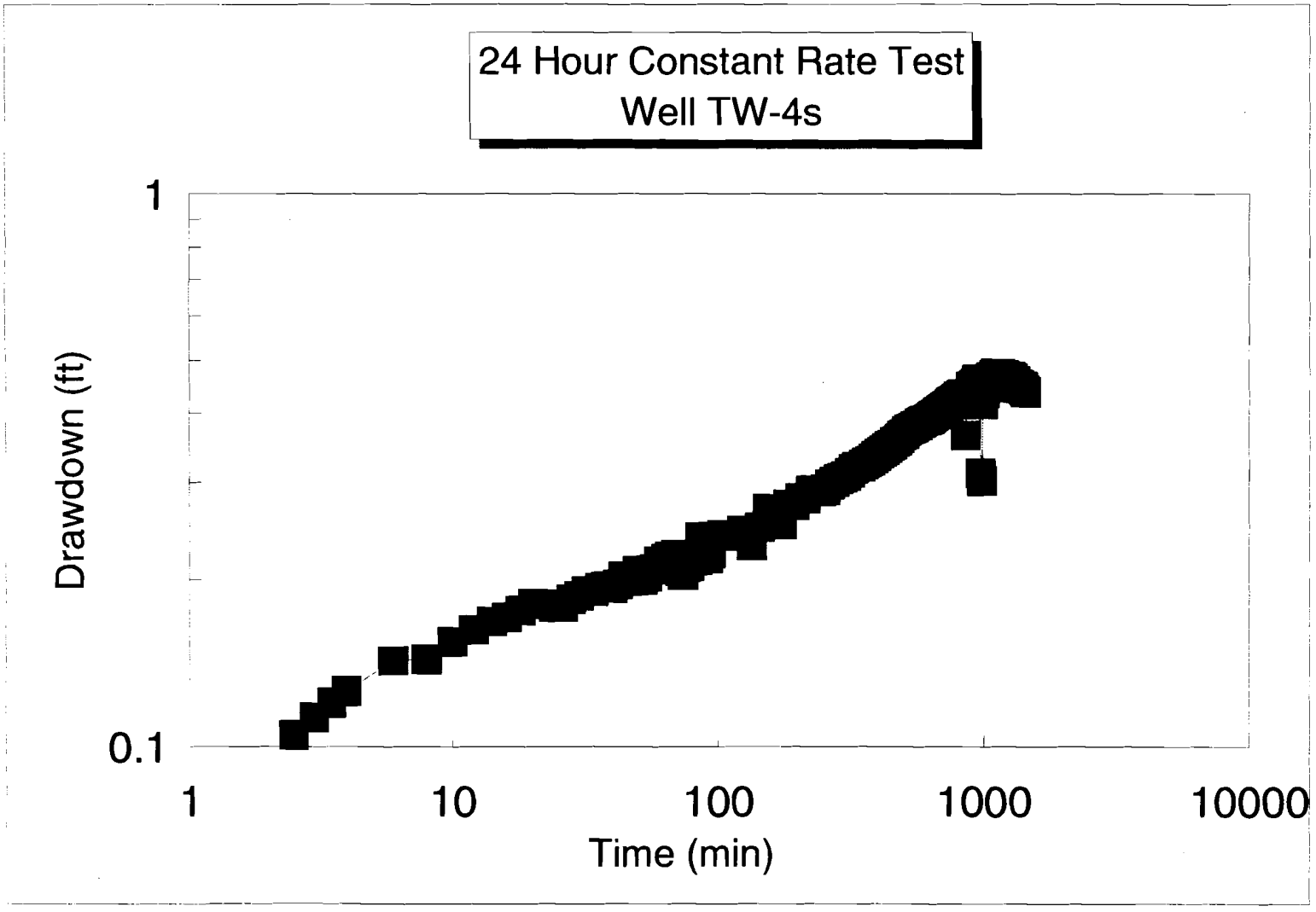
APPENDIX I

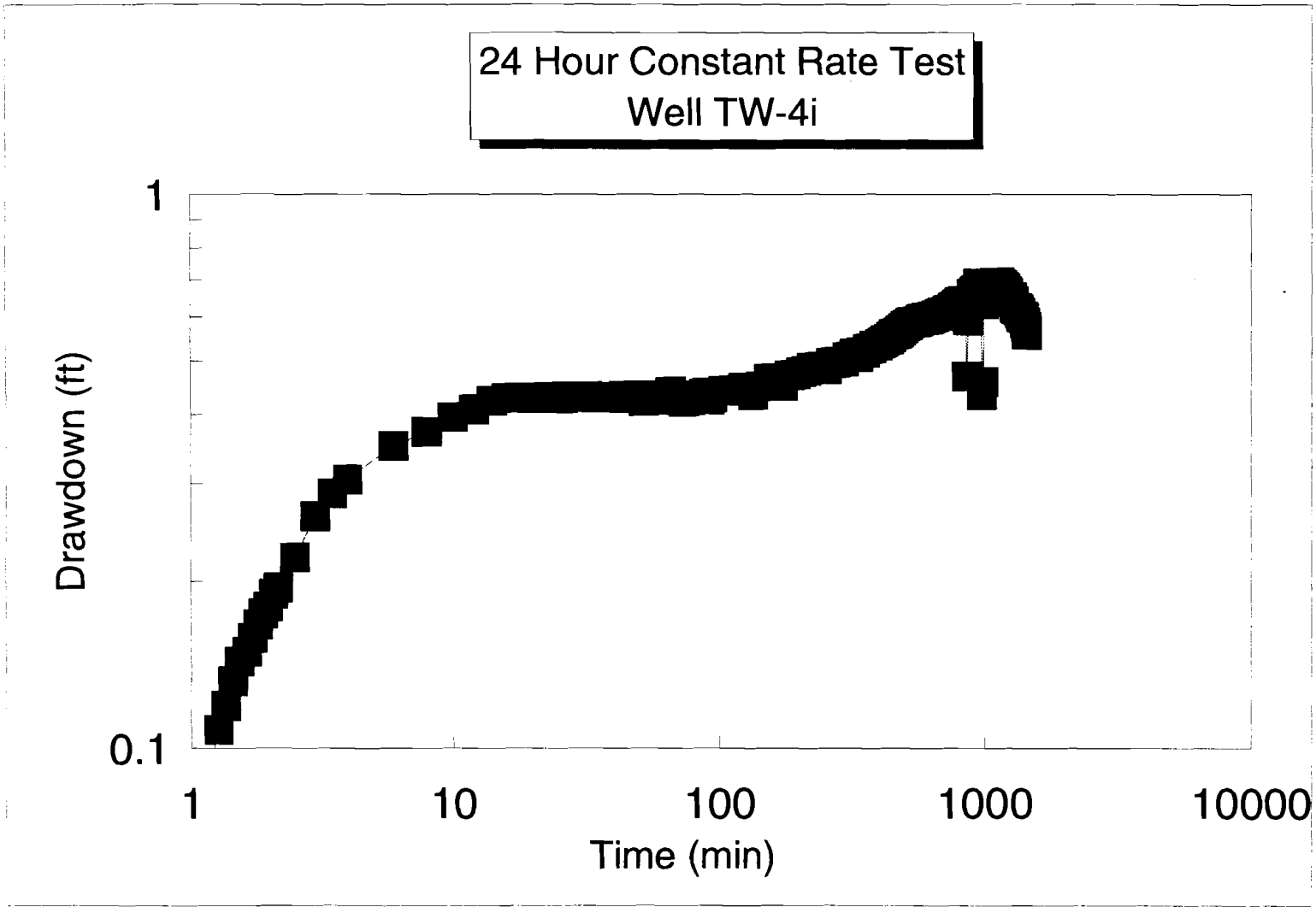
CORRECTED TIME-DRAWDOWN GRAPHS
24-HOUR CONSTANT RATE TEST

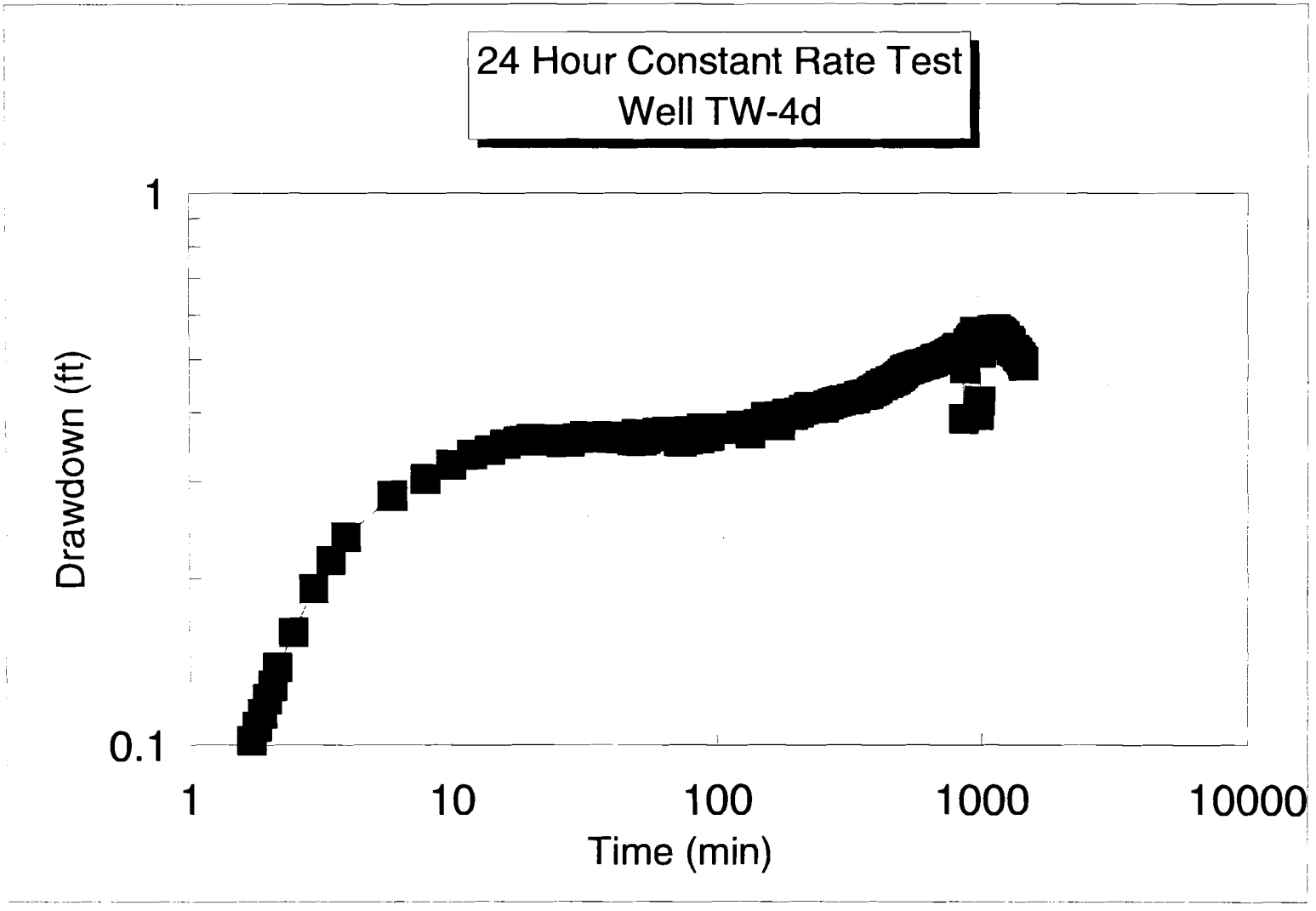

24 Hour Constant Rate Test
Well RW-1
10
1
Drawdown (ft)
1
10
100
1000
10000
Time (min)

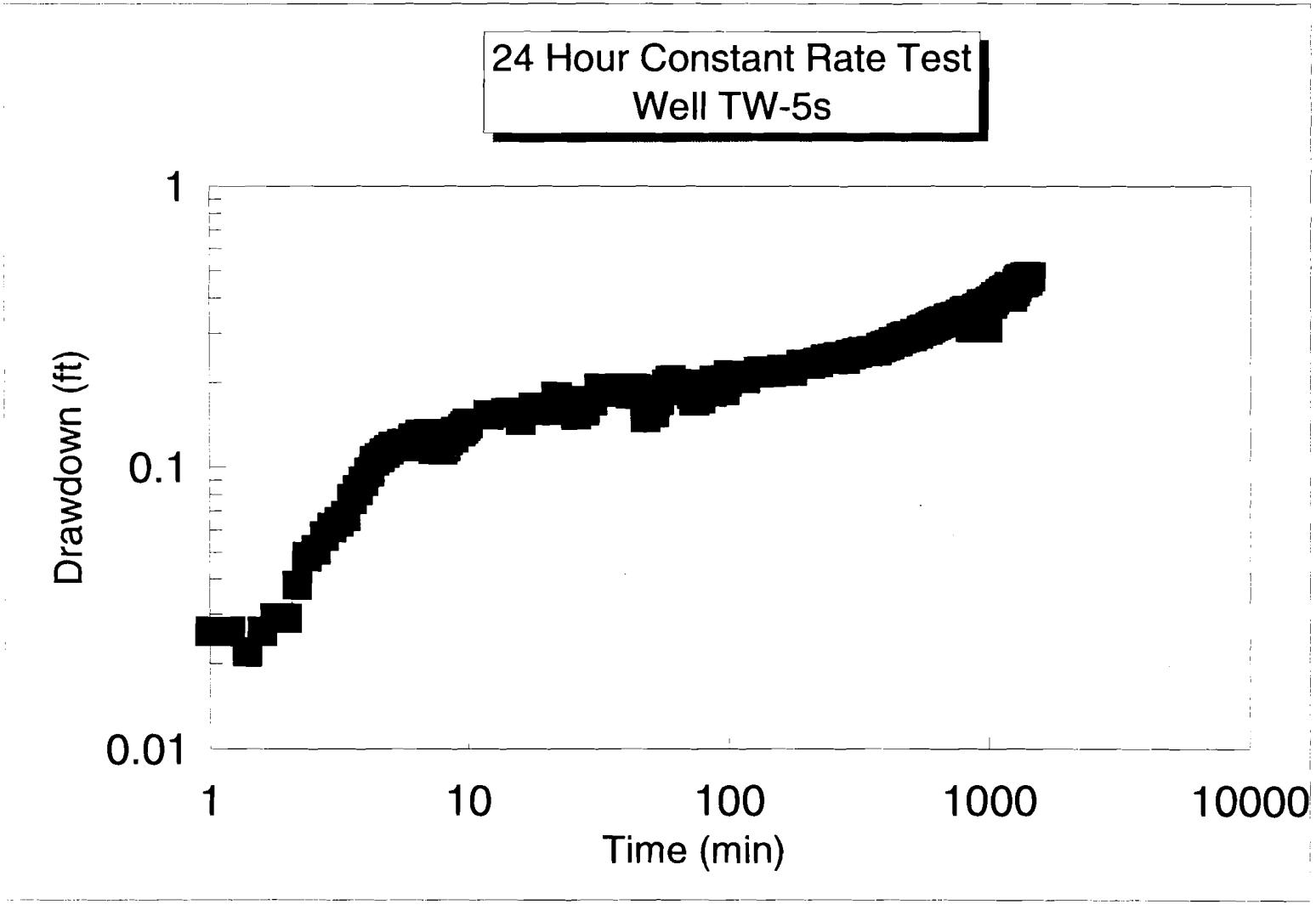

24 Hour Constant Rate Test
Well RW-2
100
10
1
Drawdown (ft)
1
10
100
1000
10000
Time (min)

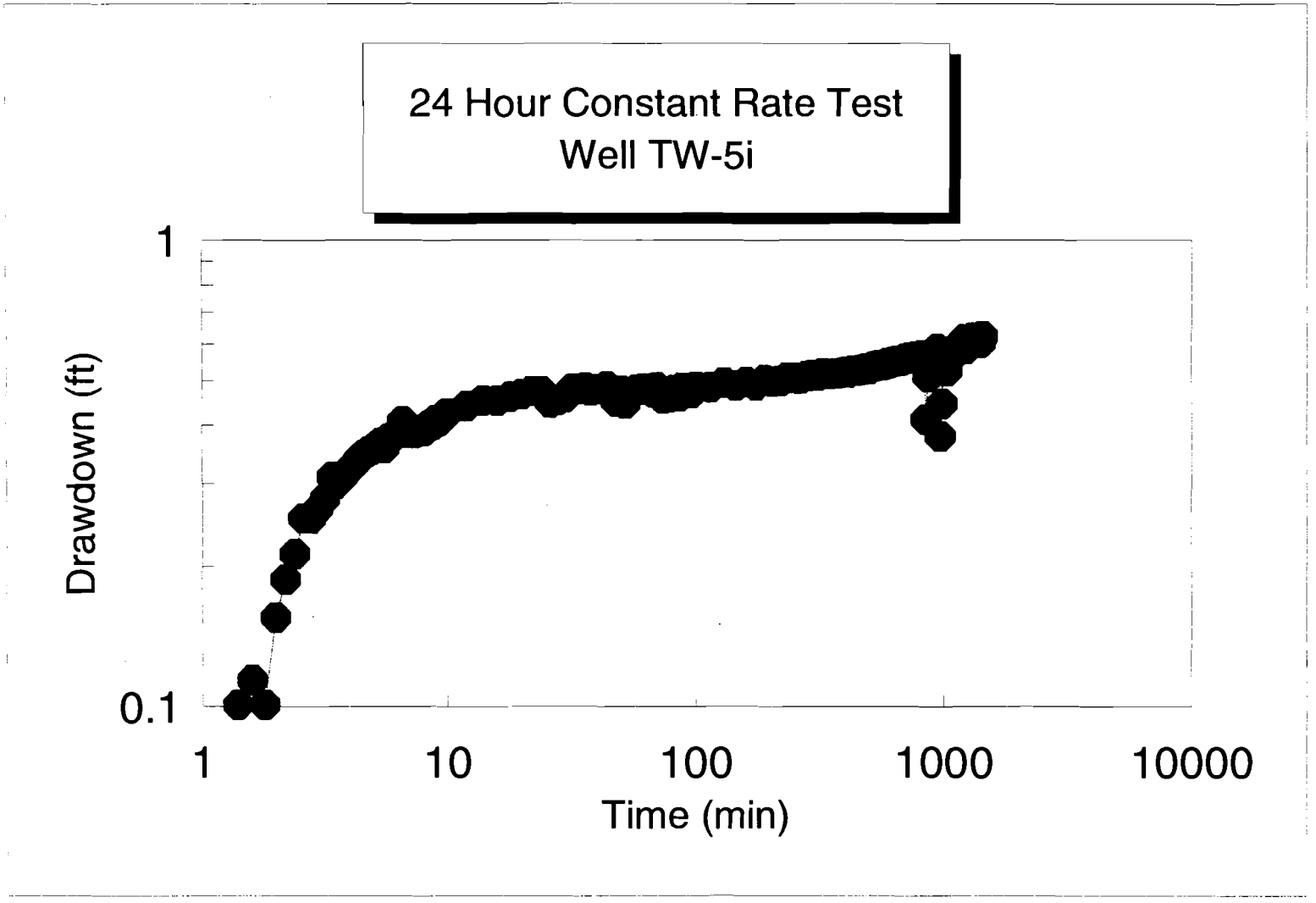

24 Hour Constant Rate Test
Well TW-3i
1
0.1
Drawdown (ft)
1
10
100
1000
10000
Time (min)

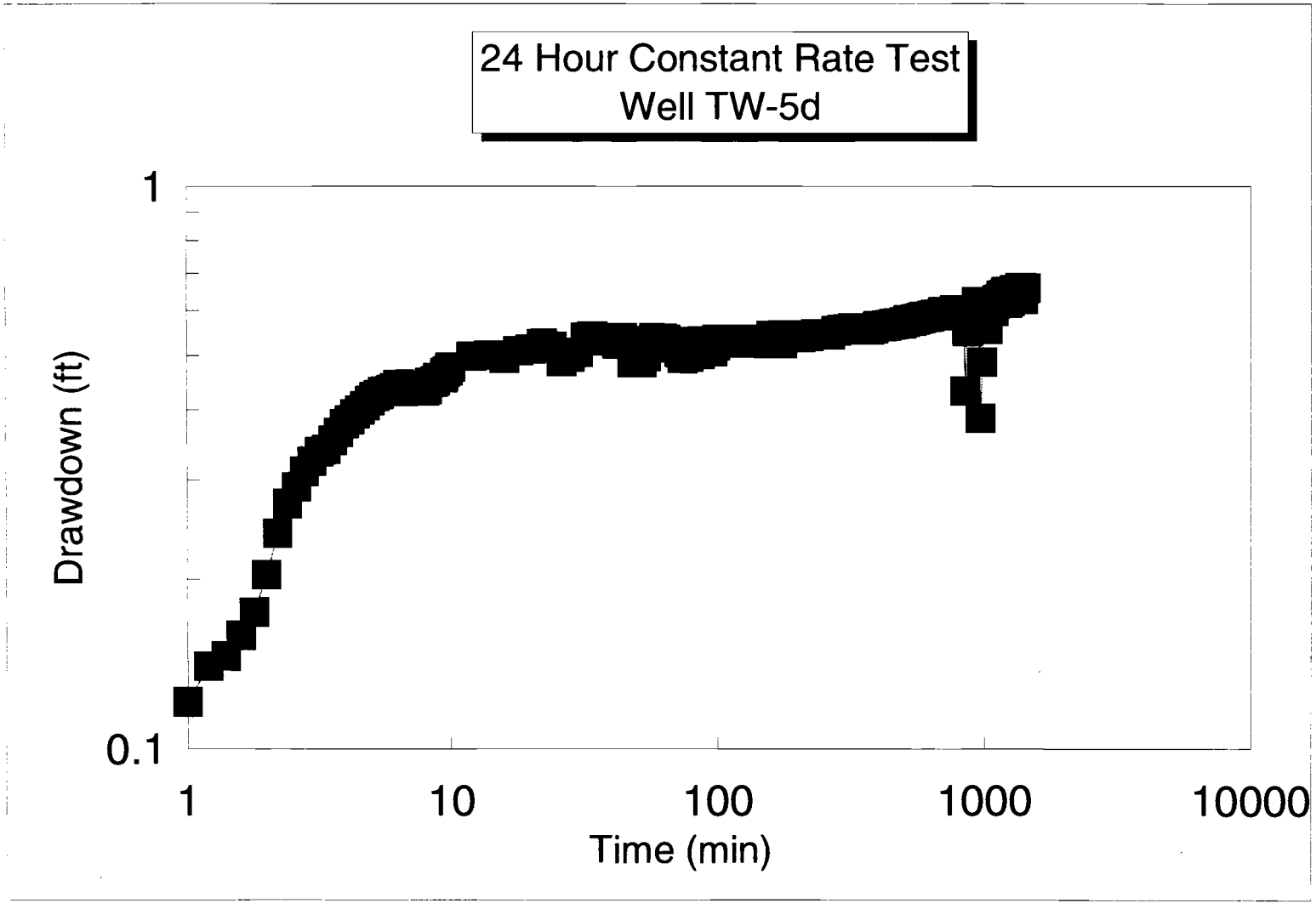

24 Hour Constant Rate Test
Well TW-4s
1
0.1
Drawdown (ft)
1
10
100
1000
10000
Time (min)

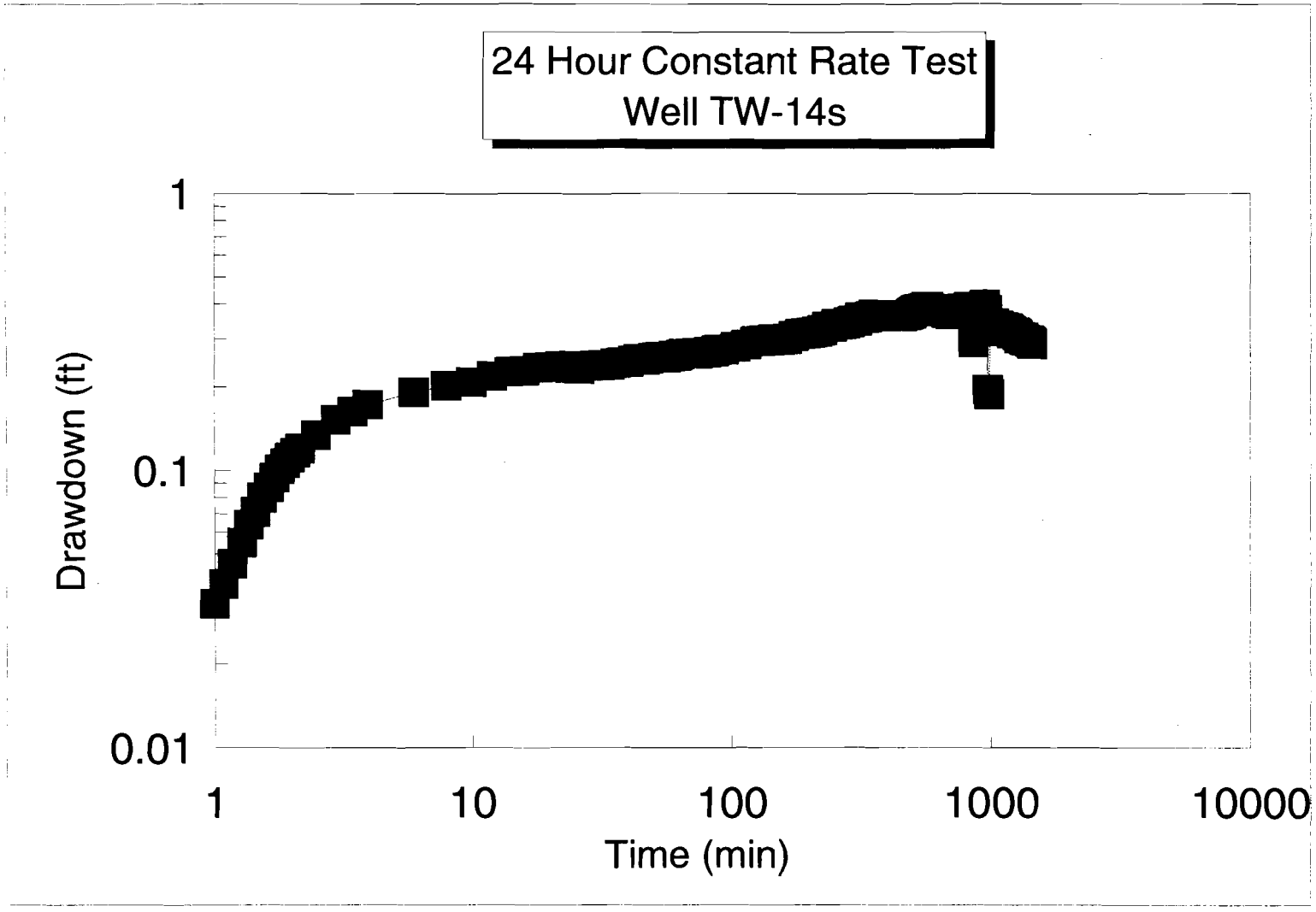

24 Hour Constant Rate Test
Well TW-4i
1
0.1
Drawdown (ft)
1
10
100
1000
10000
Time (min)

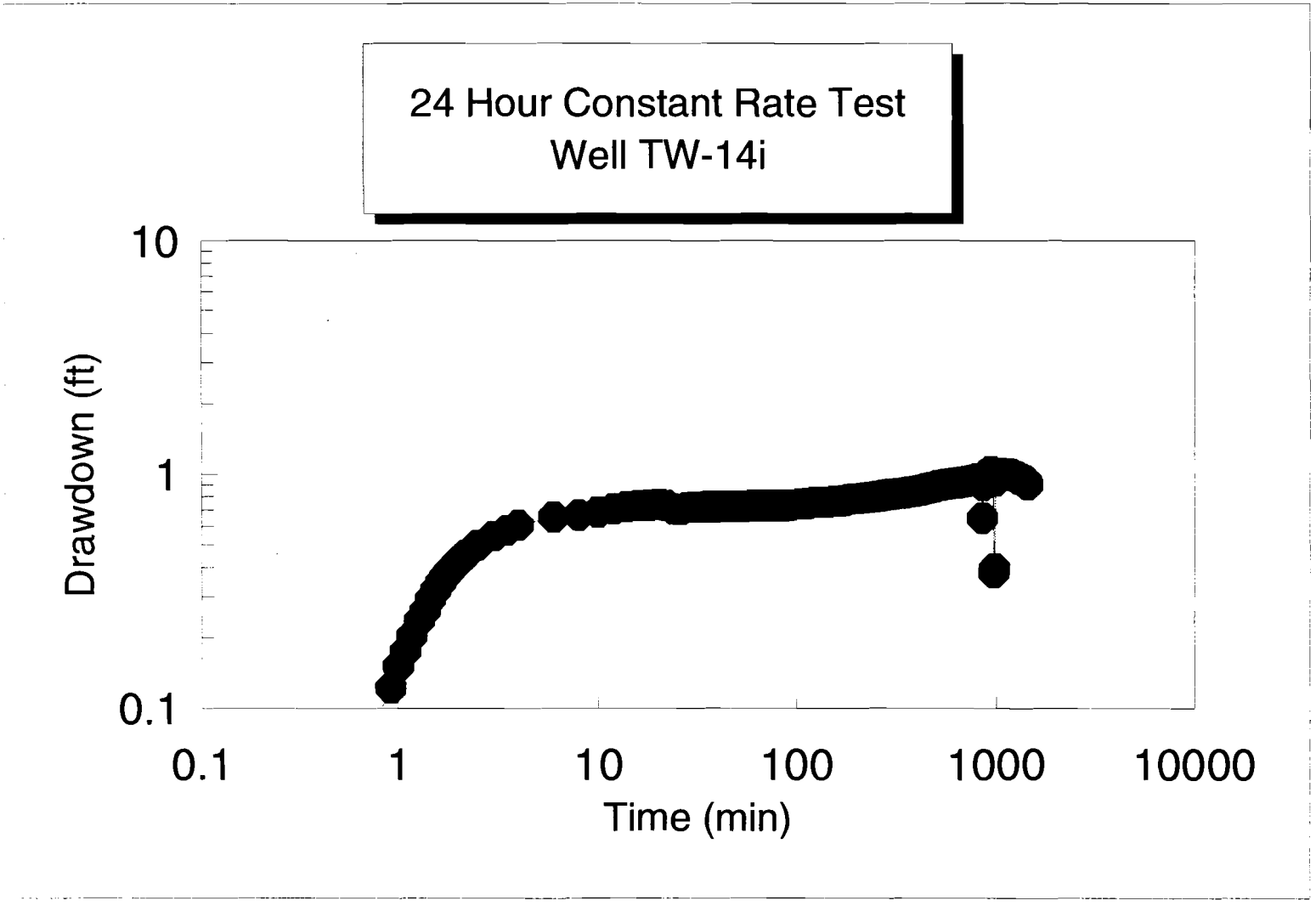

24 Hour Constant Rate Test
Well TW-4d
Drawdown (ft)
1
0.1
1
10
100
1000
10000
Time (min)

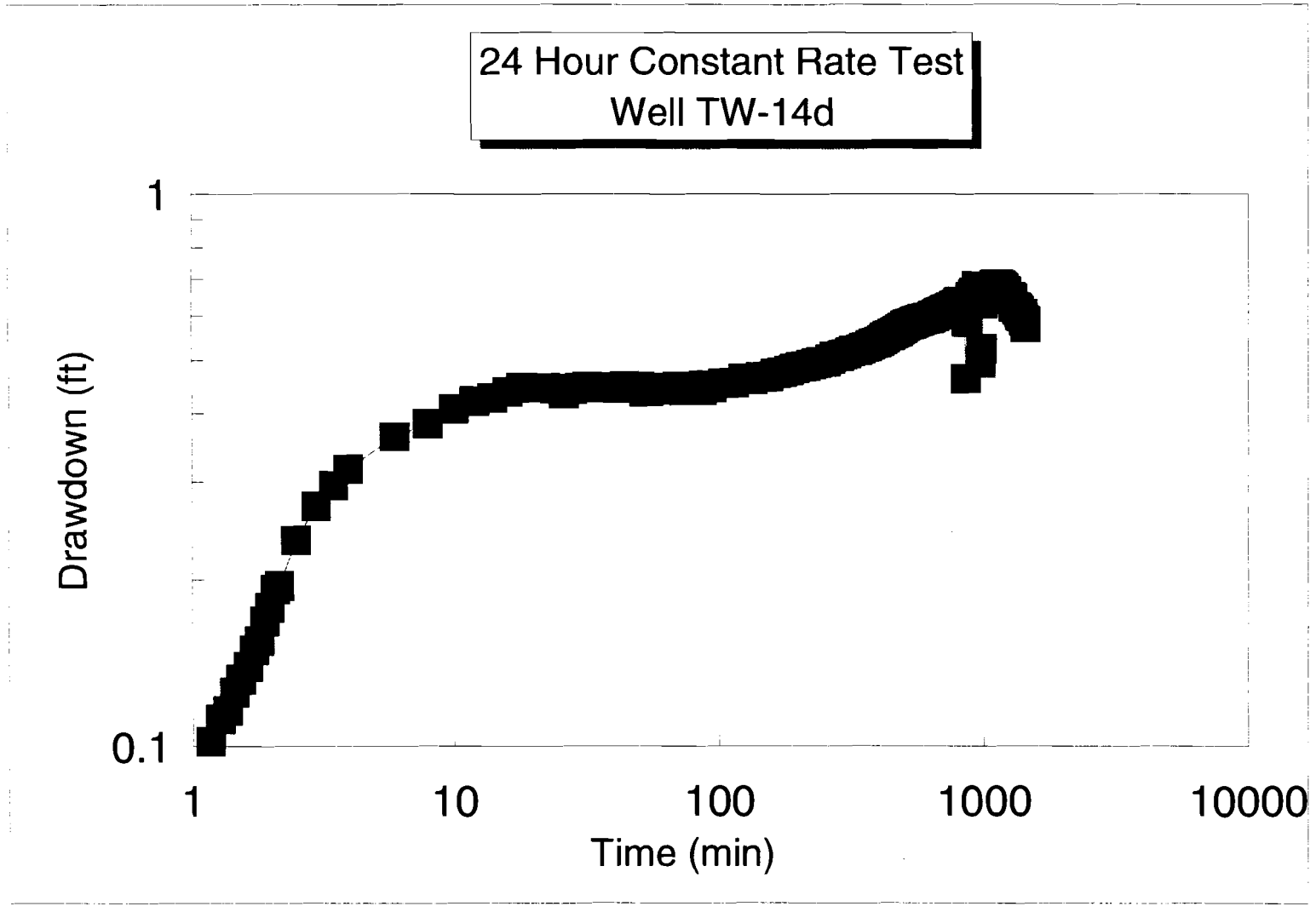

24 Hour Constant Rate Test
Well TW-5s
Drawdown (ft)
1
0.1
0.01
1
10
100
1000
10000
Time (min)

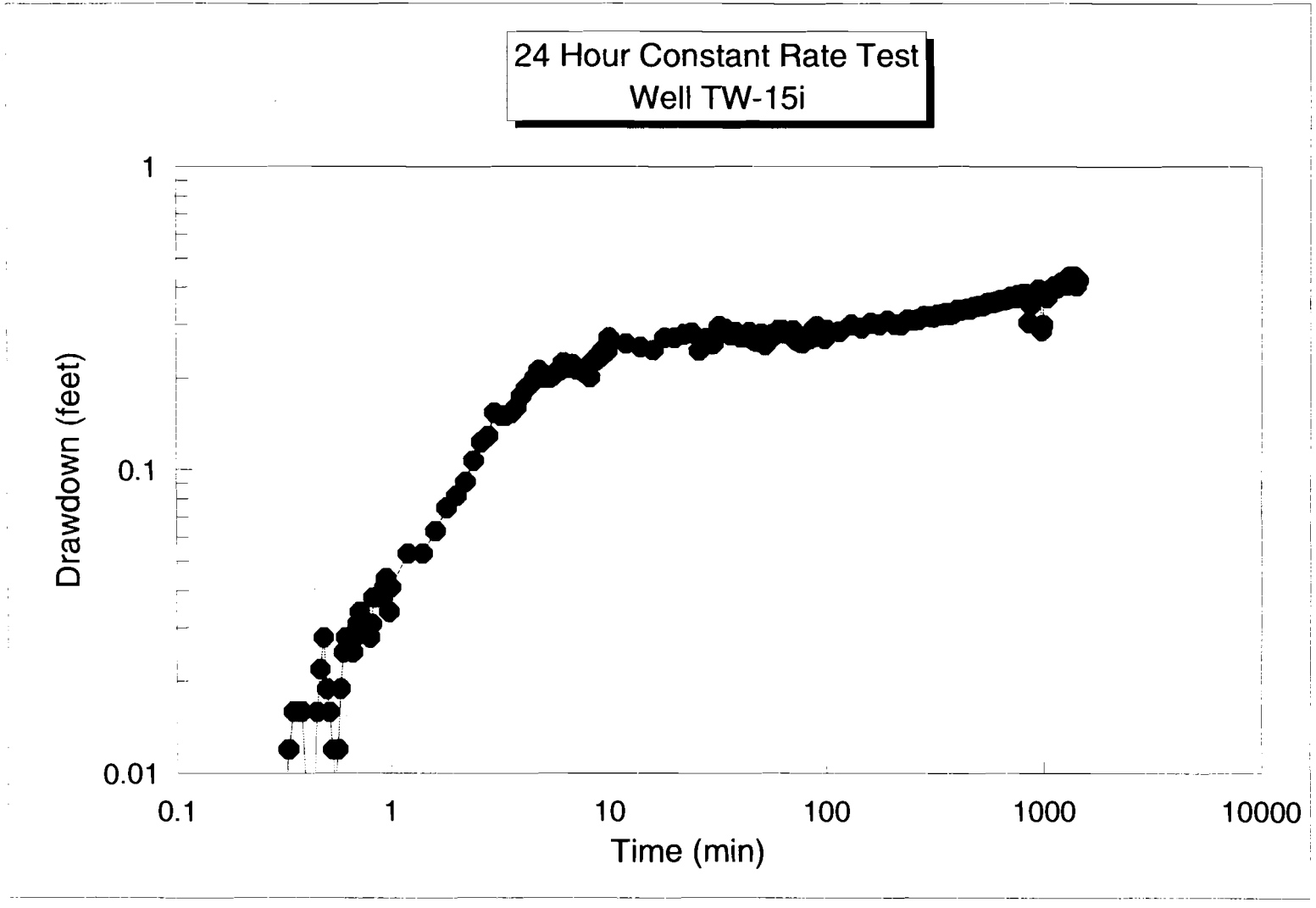

24 Hour Constant Rate Test
Well TW-5i
1
0.1
Drawdown (ft)
1
10
100
1000
10000
Time (min)


24 Hour Constant Rate Test
Well TW-5d
1
0.1
Drawdown (ft)
1
10
100
1000
10000
Time (min)


24 Hour Constant Rate Test
Well TW-14s
Drawdown (ft)
1
0.1
0.01
1
10
100
1000
10000
Time (min)


24 Hour Constant Rate Test
Well TW-14i
Drawdown (ft)
10
1
0.1
0.1
1
10
100
1000
10000
Time (min)


24 Hour Constant Rate Test
Well TW-14d
1
0.1
Drawdown (ft)
1
10
100
1000
10000
Time (min)


24 Hour Constant Rate Test
Well TW-15i
Drawdown (feet)
1
0.1
0.01
0.1
1
10
100
1000
10000
Time (min)

APPENDIX J

STRELTSOVA METHOD PUMPING TEST AQUIFER ANALYSIS

ANALYSIS OF TIME-DRAWDOWN DATA
USING STRELTSOVA'S (1974) CURVE-FITTING METHOD

PIEZOMETER I.D.: TW-4i RW-1 Primary Pumping Well RW-2Interference

Nonequilibrium Well Equation

$$s = \frac{114.6 * Q * W(uA,B;\ Beta,b1;b2)}{T / b1} \qquad u = \frac{1.87 * r2 * S}{T * t}$$

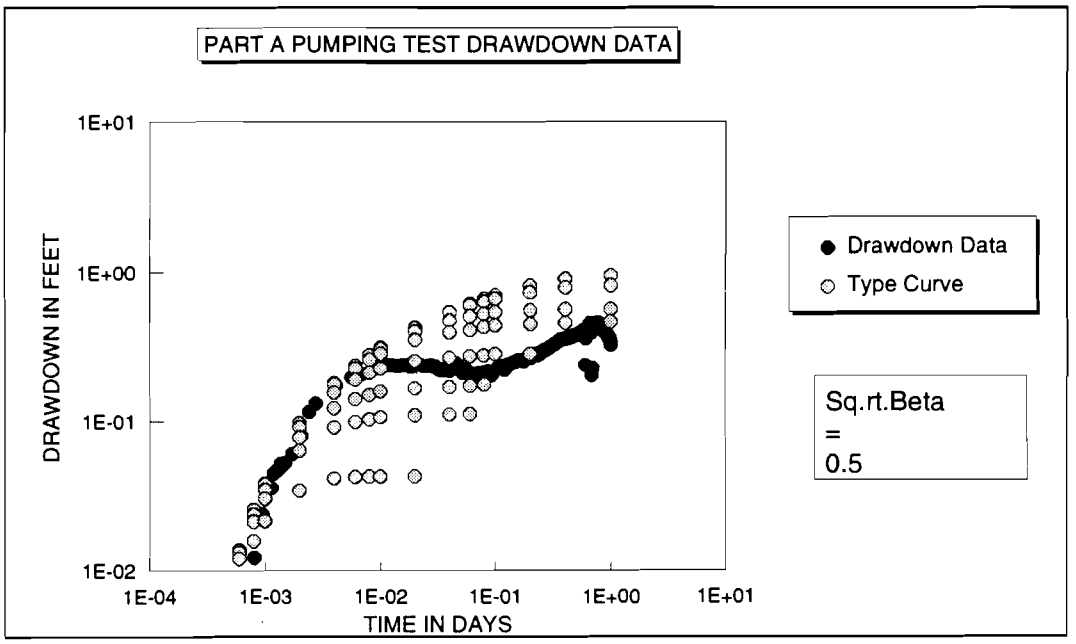
where:

s = Drawdown	(ft)	r2= Radial Distance squared	(ft sqd)
Q = Pumping Rate	(gpm)	S= Coefficient of Storage	
b1 = Penetration, pumping well	(%)	b2 = Penetration, observation well	(%)
T = Transmissivity	(gpd/ft)	t= Time Since Pumping	(days)

TEST PARAMETERS:

r = Radial Distance (ft):	35
Q = Pumping Rate (gpm):	50

MATCH POINT VALUES		SOLUTION		
1/u =	1	T =	1.34E+04	gpd/ft
W (u) =	1		1794.489	ft2/day
t =	0.001	K=	19.939	ft/day
s=	0.35		7.03E-03	cm/sec
		Sa =	5.86E-03	



Project Name: Gladding Cordage Site Pumping Test
Project No.: 37537 Analysis By: WC
Date: 09/26/94 Checked By: PC

ANALYSIS OF TIME-DRAWDOWN DATA
USING STRELTSOVA'S (1974) CURVE-FITTING METHOD

PIEZOMETER I.D.: TW-4i RW-1 Primary Pumping Well RW-2Interference

Nonequilibrium Well Equation

$$s = \frac{114.6 * Q * W(uA,B;\ Beta,b1;b2)}{T / b1} \qquad u = \frac{1.87 * r2 * S}{T * t}$$

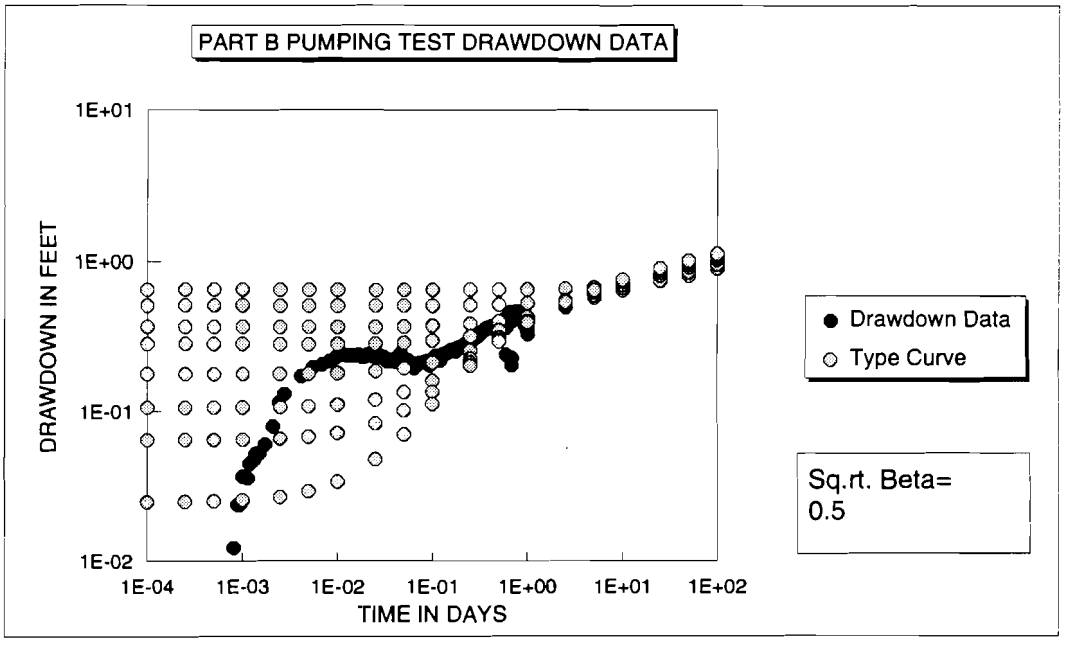
where:

s = Drawdown	(ft)	r2= Radial Distance squared (ft sqd)
Q = Pumping Rate	(gpm)	S= Coefficient of Storage
T = Transmissivity	(gpd/ft)	t= Time Since Pumping (days)

TEST PARAMETERS:

r = Radial Distance (ft):	35
Q= Pumping Rate (gpm):	50

MATCH POINT VALUES		SOLUTION		
1/u =	1	T =	3.49E+04	gpd/ft
W (u) =	1		4670.368	ft2/day
t =	0.05	K=	51.893	ft/day
s=	0.2		1.83E-02	cm/sec
		S y=	7.63E-01	



Project Name: Gladding Cordage Site Pumping Test
Project No.: 37537 Analysis By: WC
Date: 09/26/94 Checked By: PC

ANALYSIS OF TIME-DRAWDOWN DATA
USING STRELTSOVA'S (1974) CURVE-FITTING METHOD

PIEZOMETER I.D.: TW-5i RW-2 Primary Pumping Well RW-1Interference

Nonequilibrium Well Equation

$$s = \frac{114.6 * Q * W(uA,B;\ Beta,b1;b2)}{T / b1} \qquad u = \frac{1.87 * r2 * S}{T * t}$$

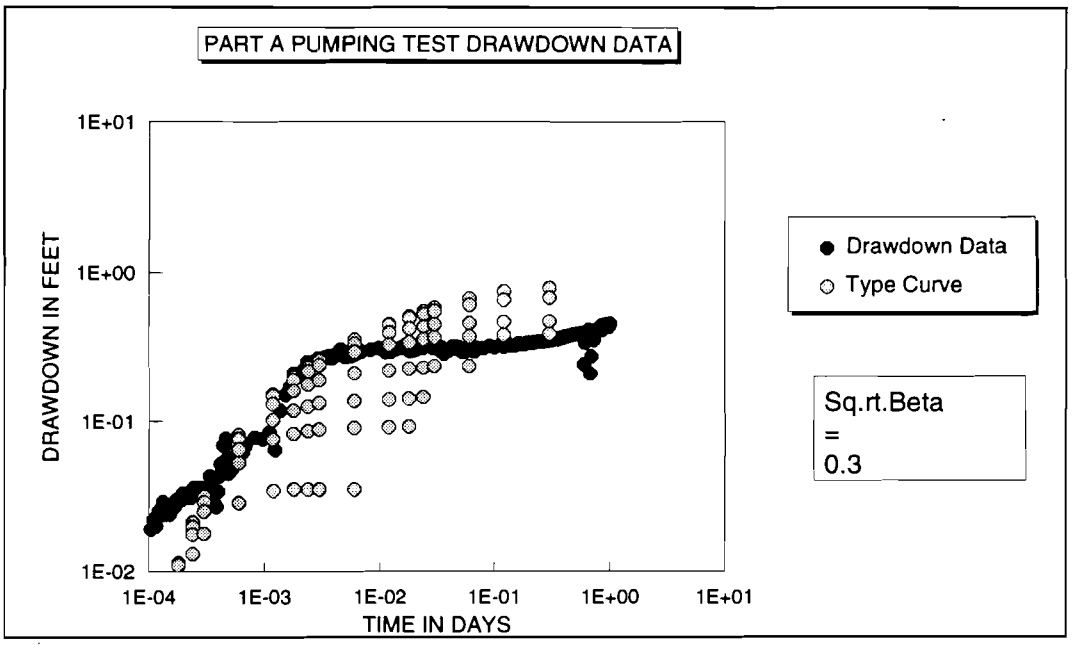
where:

s = Drawdown (ft)
Q = Pumping Rate (gpm)
b1 = Penetration, pumping well (%)
T = Transmissivity (gpd/ft)
r2= Radial Distance squared (ft sqd)
S= Coefficient of Storage
b2 = Penetration, observation well (%)
t= Time Since Pumping (days)

TEST PARAMETERS:

r = Radial Distance (ft):	37
Q = Pumping Rate (gpm):	50

MATCH POINT VALUES		SOLUTION		
1/u =	1	T =	1.34E+04	gpd/ft
W (u) =	1		1795.998	ft2/day
t =	0.0003	K=	19.956	ft/day
s=	0.29		7.04E-03	cm/sec
		Sa =	1.57E-03	



Project Name: Gladding Cordage Site Pumping Test
Project No.: 37537 Analysis By: WC
Date: 09/26/94 Checked By: PC

ANALYSIS OF TIME-DRAWDOWN DATA
USING STRELTSOVA'S (1974) CURVE-FITTING METHOD

PIEZOMETER I.D.: TW-5i RW-2 Primary Pumping Well RW-1Interference

Nonequilibrium Well Equation

$$s = \frac{114.6 * Q * W(uA,B; Beta,b1;b2)}{T / b1} \qquad u = \frac{1.87 * r2 * S}{T * t}$$

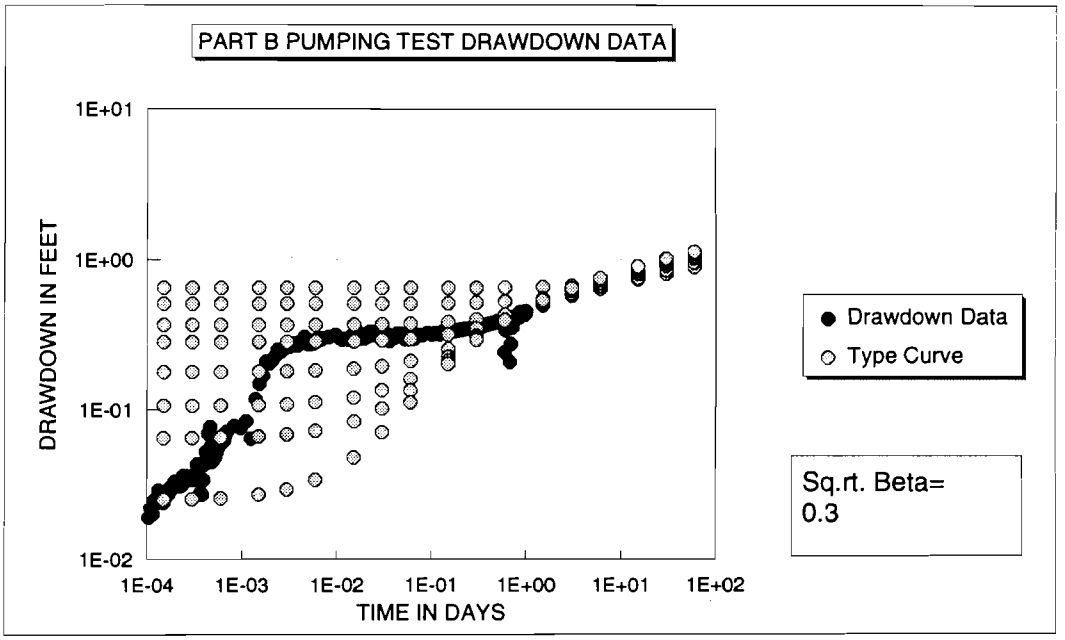
where:

s = Drawdown	(ft)	r2= Radial Distance squared	(ft sqd)
Q = Pumping Rate	(gpm)	S= Coefficient of Storage	
T = Transmissivity	(gpd/ft)	t= Time Since Pumping	(days)

TEST PARAMETERS:

r = Radial Distance (ft):	37
Q= Pumping Rate (gpm):	50

MATCH POINT VALUES		SOLUTION		
1/u =	1	T =	4.21E+04	gpd/ft
W (u) =	1		5631.915	ft2/day
t =	0.03	K=	62.577	ft/day
s=	0.2		2.21E-02	cm/sec
		S y=	4.94E-01	



Project Name: Gladding Cordage Site Pumping Test
Project No.: 37537 Analysis By: WC
Date: 09/26/94 Checked By: PC

ANALYSIS OF TIME-DRAWDOWN DATA
USING STRELTSOVA'S (1974) CURVE-FITTING METHOD

PIEZOMETER I.D.: TW-14i RW-1 Primary Pumping Well RW-2Interference

Nonequilibrium Well Equation

$$s = \frac{114.6 * Q * W(uA,B;\ Beta,b1;b2)}{T / b1} \qquad u = \frac{1.87 * r2 * S}{T * t}$$

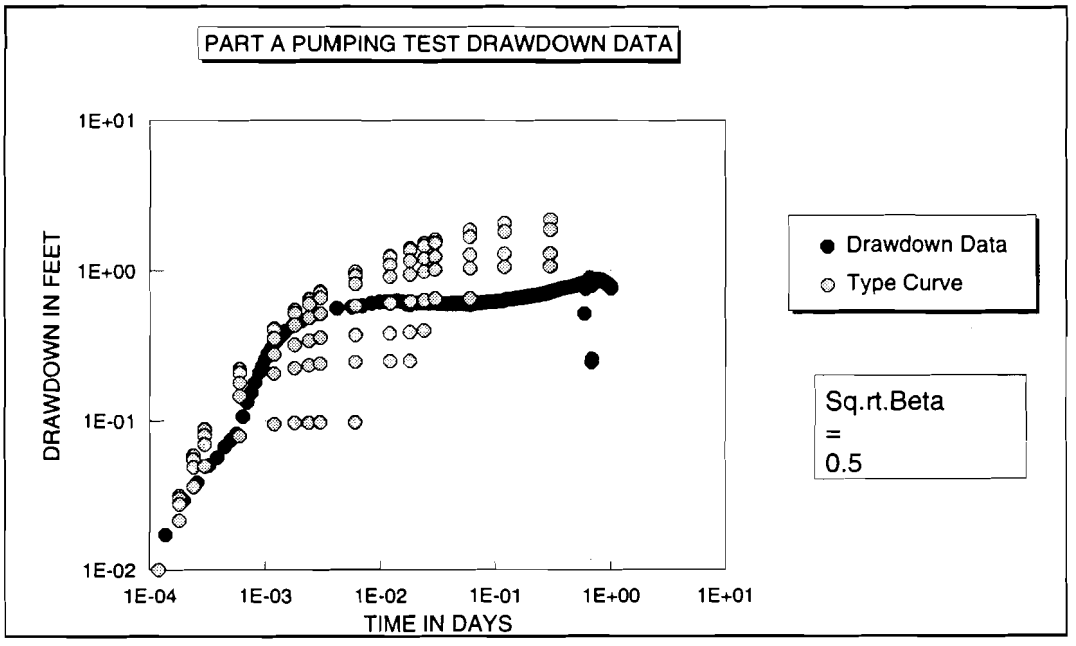
where:

s = Drawdown	(ft)	r2= Radial Distance squared	(ft sqd)
Q = Pumping Rate	(gpm)	S= Coefficient of Storage	
b1 = Penetration, pumping well	(%)	b2 = Penetration, observation well	(%)
T = Transmissivity	(gpd/ft)	t= Time Since Pumping	(days)

TEST PARAMETERS:

r = Radial Distance (ft):	56
Q = Pumping Rate (gpm):	50

MATCH POINT VALUES		SOLUTION		
1/u =	1	T =	5.87E+03	gpd/ft
W (u) =	1		785.0889	ft2/day
t =	0.0003	K=	8.723	ft/day
s=	0.8		3.08E-03	cm/sec
		Sa =	3.00E-04	



Project Name: Gladding Cordage Site Pumping Test
Project No.: 37537 Analysis By: WC
Date: 09/26/94 Checked By: PC

ANALYSIS OF TIME-DRAWDOWN DATA
USING STRELTSOVA'S (1974) CURVE-FITTING METHOD

PIEZOMETER I.D.: TW-14i RW-1 Primary Pumping Well RW-2Interference

Nonequilibrium Well Equation

$$s = \frac{114.6 * Q * W(uA,B;\ Beta,b1;b2)}{T / b1} \qquad u = \frac{1.87 * r2 * S}{T * t}$$

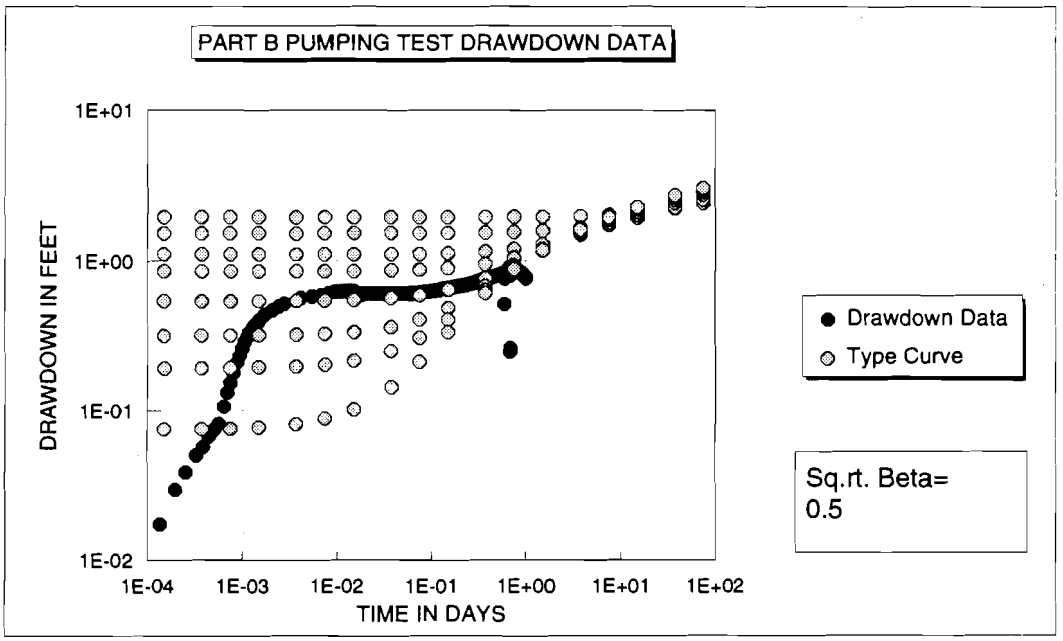
where:

s = Drawdown	(ft)	r2= Radial Distance squared (ft sqd)
Q = Pumping Rate	(gpm)	S= Coefficient of Storage
T = Transmissivity	(gpd/ft)	t= Time Since Pumping (days)

TEST PARAMETERS:

r = Radial Distance (ft):	56
Q= Pumping Rate (gpm):	50

MATCH POINT VALUES		SOLUTION		
1/u =	1	T =	1.16E+04	gpd/ft
W (u) =	1		1556.789	ft2/day
t =	0.075	K=	17.298	ft/day
s=	0.6		6.10E-03	cm/sec
		S y=	1.49E-01	



Project Name: Gladding Cordage Site Pumping Test
Project No.: 37537 Analysis By: WC
Date: 09/26/94 Checked By: PC

ANALYSIS OF TIME-DRAWDOWN DATA
USING STRELTSOVA'S (1974) CURVE-FITTING METHOD

PIEZOMETER I.D.: TW-15i (RW-1 and RW-2 Pumping Wells Combined)

Nonequilibrium Well Equation

$$s = \frac{114.6 * Q * W(uA,B;\ Beta,b1;b2)}{T / b1} \qquad u = \frac{1.87 * r2 * S}{T * t}$$

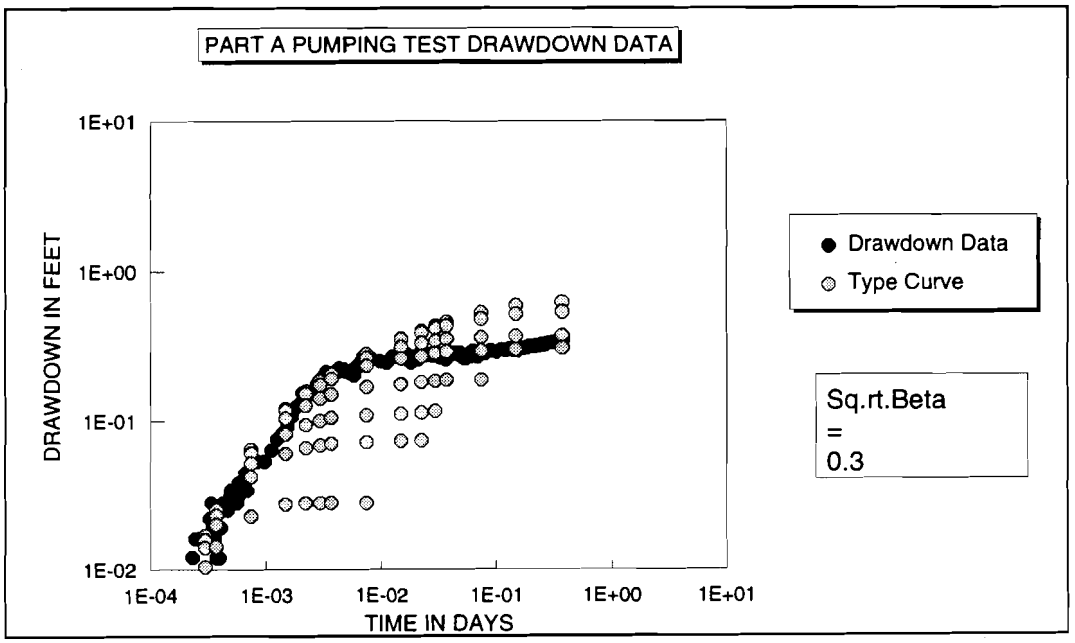
where:

s = Drawdown	(ft)	r2= Radial Distance squared	(ft sqd)
Q = Pumping Rate	(gpm)	S= Coefficient of Storage	
b1 = Penetration, pumping well	(%)	b2 = Penetration, observation well	(%)
T = Transmissivity	(gpd/ft)	t= Time Since Pumping	(days)

TEST PARAMETERS:

r = Radial Distance (ft):	149
Q = Pumping Rate (gpm):	100

MATCH POINT VALUES		SOLUTION		
1/u =	1	T =	3.74E+04	gpd/ft
W (u) =	1		4995.263	ft2/day
t =	0.00037	K=	55.503	ft/day
s=	0.23		1.96E-02	cm/sec
		Sa =	3.33E-04	



Project Name: Gladding Cordage Site Pumping Test
Project No.: 37537 Analysis By: WC
Date: 09/26/94 Checked By: PC

ANALYSIS OF TIME-DRAWDOWN DATA
USING STRELTSOVA'S (1974) CURVE-FITTING METHOD

PIEZOMETER I.D.: TW-15i (RW-1 and RW-2 Pumping Wells Combined)

Nonequilibrium Well Equation

$$s = \frac{114.6 * Q * W(uA,B;\ Beta,b1;b2)}{T / b1} \qquad u = \frac{1.87 * r2 * S}{T * t}$$

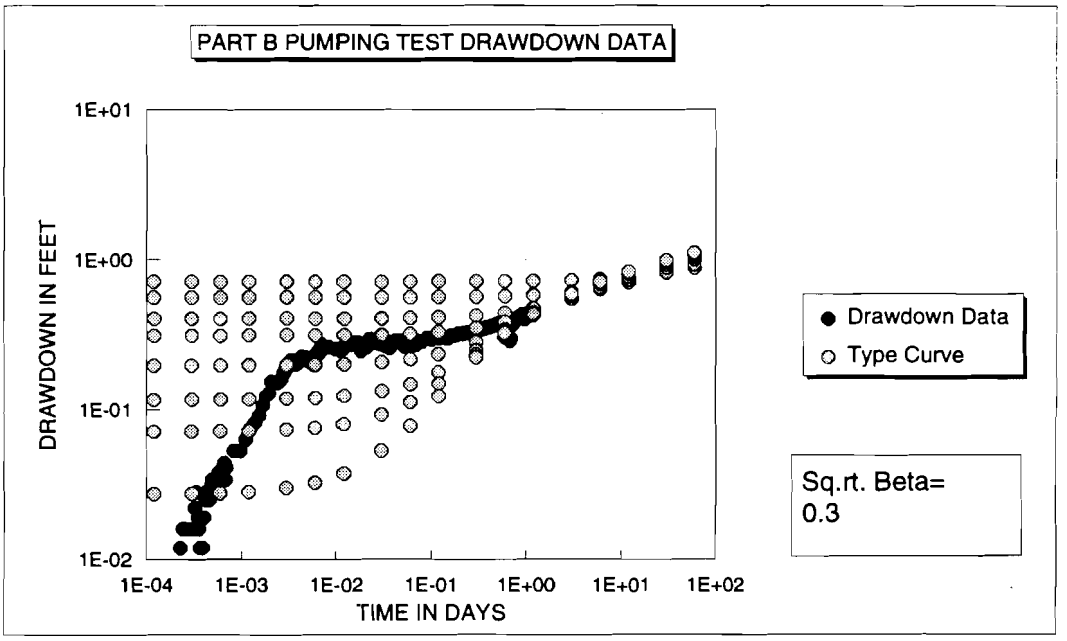
where:

s = Drawdown	(ft)	r2= Radial Distance squared	(ft sqd)
Q = Pumping Rate	(gpm)	S= Coefficient of Storage	
T = Transmissivity	(gpd/ft)	t= Time Since Pumping	(days)

TEST PARAMETERS:

r = Radial Distance (ft):	149
Q= Pumping Rate (gpm):	100

MATCH POINT VALUES		SOLUTION		
1/u =	1	T =	6.95E+04	gpd/ft
W (u) =	1		9284.126	ft2/day
t =	0.06	K=	103.157	ft/day
s=	0.22		3.64E-02	cm/sec
		S y=	1.00E-01	



Project Name:	Gladding Cordage Site Pumping Test		
Project No.:	37537	Analysis By:	WC
Date:	09/26/94	Checked By:	PC