PHASE I
REMEDIAL INVESTIGATION

Sunnyside Yard
Queens, New York

Volume III of III

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Prepared for:

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Washington D.C.

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APPENDIX F

Data Validation Report

Data Validation Services

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TO: Roux Associates

FROM: Judy Harry, Data Validation Services J. Harry

DATE: 3-30-91, Revision No. 2 4-9-91

RE: Validation report for Sunnyside Yard Site project

Review has been completed on sample data collected at the Sunnyside Yard Site, and analysed by Envirosystems, Inc. Aqueous, soil, and oil samples were processed for various parameters including PCBs, TPHs, TOC, and the CLP Target Compound List. The analyses were to have been performed according to the EPA Contract Laboratory Protocol, EPA-8080, and EPA 418.1 (for TPH). Original submissions of the data packages for this project were not complete with raw data required for validation. Resubmissions were requested and submitted until verification of reported results could be made.

In summary, most of the VOA and BNA reported results are supported by the raw data and were generated in compliance with the protocol. The metals analyses were generally performed according to the required methodology, but the reporting forms submitted did not contain the required QC qualifiers. These qualifiers were added during validation. The Pesticide and PCB analyses were neither performed nor documented according to the protocol requirements. Extensive examination of the raw data resulted in the correction of many reported values. Consistent failure of QC criteria necessitated that all reported results above contract required detection limit for pesticides and PCBs be considered estimated. Total Petroleum Hydrocarbon data is generally compliant, but should be reported to not more than two significant figures due to blank and methodology limitations. The figure reported for Total Organic Carbon for sample MW-16(6-8) was not generated by a method applicable to TOC determinations. Noncompliancies for each analysis fraction are discussed in more detail in the subsections below.

Reported result forms included with the data packages have been edited with corrected values and additional QC qualifiers, and are attached to this report. All organic values on the reporting forms in this report are based on wet-weight and have not been corrected for sample percent solids.

GENERAL COMMENTS AND NONCOMPLIANCIES

All results and detection limits for the organic parameters were reported on an as-received, wet-weight basis. Because solids determinations were not available during this review, this validation report will also report organic values and corrections thereof on a wet-weight basis. The metals analyses results are on a dry-weight basis.

No pH determinations were included or reported for the samples in this project.

The chain-of-custody for samples collected 10/5/90 did not contain a signature indicating receipt of the samples at the laboratory. In house chain-of-custody is not included in the data package.

NYSDEC tracking forms were not included with the data packages.

The attached case narratives outline many specific QC considerations. Others are outlined in the subsections below:

VOLATILE ANALYSES

Holding times were met for the volatile analyses.

Sample S-82(0-2) R reported toluene at a level of "2.5 J." The spectrum is not included for review, and the hit was rejected upon lab review. This sample should show "5.0 U" for the toluene result.

Surrogate standard recoveries were good for the aqueous samples. Sample MW-13 exhibited elevated recovery of surrogate d4-dichloroethane for two analyses, but sample reported results are not affected. Several soil samples (S-22(0-2), S-82(0-2), S-80(2-4), and S-90) showed repeated failure of surrogate d8-toluene. The surrogate was falsely elevated in recovery, above the allowable limit of 117%, due to the low recovery of its associated internal standards in these samples. Although the sample matrix is often the cause of depressed internal standard recoveries, it should be noted that the method blank run with the latter two samples produced a d8-toluene recovery of 116%, just within the allowable limit. The surrogate and internal standard failures in these samples cause the reported toluene values within to be considered estimated.

Aqueous and soil matrix spike recoveries and relative percent differences were all within recommended limits except the toluene (and d8-toluene surrogate) recoveries in sample S-22(0-2), mentioned above.

Instrument tunes and method blanks were performed in compliance with the protocol.

Calibration standards met the required performance criteria, which pertain only to certain of the parameters, but percent differences (%Ds) of some continuing calibration factors were often over 30%. Some of the elevated % Ds in the 5 point calibrations are due to errors in standard spiking. The compounds showing extreme %Ds (such as carbon tetrachloride at 100%D and 81%D) were not detected in the samples, and detection limits were not made suspect. Consequently, these standard variances do not affect reported results for this project.

Tentative Identification Compound lists were provided when requested under separate cover.

BASE/NEUTRAL/ACID ANALYSES

Holding times for the start of the initial extractions were met for all samples except S-90, which was extracted 1 day beyond the allowable holding time. The results and detection limits for S-90 are flagged as estimated, and could be biased low. Although the extractions were initiated within the required time, in some cases the final concentration step was not performed until a week later.

Benzo(b)fluoranthene and benzo(k)fluoranthene are reported as a combined number in this data package.

The surrogate recoveries of the soil extracts were reported incorrectly in the data package summaries. Recoveries are actually twofold higher for all samples and blanks except S-90, S-80 (2-4), and Method Blank 10-9-90. The recoveries were quite low as originally reported; this correction shows the results to be more acceptable. Samples S-41A(3-5), S-43(0-2), S-61(5-7), S-62(0-2), and S-64(2-3) had elevated backgrounds which necessitated dilution prior to analysis. In these cases, surrogate recovery cannot be determined accurately.

The aqueous samples produced inconsistent surrogate recoveries in several instances (Field Blank #3, MW-26, MW-29, and MS-9), where initial extractions produced failing surrogate recoveries, but the recoveries upon reextraction were within allowable ranges. Th original extract data is unusable; the reextractions of these samples occured 5 days beyond the holding time and the results have been flagged as estimated, and should be considered biased low. Many aqueous surrogate recoveries are just above the lower allowable limit. Two trip blanks produced base/neutral surrogate outliers.

Samples MW-23 and MW-29 produced no recovery of acid surrogates with repeated extraction. Consequently the results for acidic components in these samples have been flagged as inconclusive. The base/neutral surrogates produced acceptable recovery. The reextractions of these samples were performed beyond the allowable holding time and the base/neutral parameters have thusly been flagged as estimated.

Sample MW-26(9-11) produced no recovery of acid surrogates during its first extraction. Its associated method blank also produced very low surrogate recoveries, and the sample was reextracted. The surrogate recoveries were acceptable for the second extraction, but it was performed 29 days from sample receipt (protocol requires a 5 day holding time). The results of this sample have been flagged as unusable for both analyses.

Samples MW-1 and MW-25 produced surrogate recoveries less than 10% Recovery, and should have been repeated.

Method blanks from extractions on 10/18/90, 12/4/90, and 1/3/91 each had a surrogate outlier, which is prohibited by protocol. Samples associated with these blanks should have been reextracted and reanalysed, but were not.

Aqueous matrix spike recoveries were good. The soil matrix spikes produced six outlying recoveries, including pyrene.

Sample S-22(0-2) 1:5 dilution should have reported benzo(b and k)fluoranthene at a level of 4595 ug/kg, as the raw data indicates.

There should not have been a reported value for N-nitrosodiphenylamine for sample S-43(0-2). It should be reported as "3300 U".

Samples S-22(0-2), S-49(2-4), S-47(2-4), and S-17(0-2) did not recover internal standard areas within acceptable range upon repeated analyses. The analyses were performed in compliance with protocol, and the outliers are matrix related. The detected target compound values should be considered estimated due to the quantitative effect of potentially inaccurate internal standard areas.

Instrumental tunes and method blanks were performed and documented in compliance with protocol.

The initial multipoint and the daily continuing calibration standards met criteria as outlined in the protocol. However, many continuing standards had % differences from the 5 point curve that exceeded recommended criteria. Acidic components, none of which were detected in any of the samples, had %Ds consistently over 40% (a value above 30% is considered out of control). The aniline compounds often had %Ds from 60-80%. The polynuclear hydrocarbon (PAH) standards, some of which were detected in some samples, produced %Ds 30-50%.

The aqueous Tentatively Identified Compound (TIC) lists were provided under separate cover.

PCB/PESTICIDE ANALYSES

All PCB and pesticide results, where detected above the detection limit, should be considered estimated due to noncompliant methodology. Although the laboratory indicates that EPA CLP was followed, noncompliancies exist in the analysis procedure. The nature of these noncompliancies are quality control violations which necessitate qualifying the reported values of the samples. Documentation of the Pest/PCB data is insufficient. No summary data is provided, and there was incomplete review of standard and system criteria. Chromatograms were not labeled with standard IDs and levels, and many of the copies were abbreviated and did not contain all raw data retention times and areas necessary for the validation calculation corrections.

Quality control criteria required by EPA CLP and 8080 protocols were violated during the course of this project. System linearity, degradation, retention time, and calibration factor consistency criteria were not monitored and were not within the allowable limits for sample processing. The retention times on the DB-1701 column, used for confirmation, and in a few cases primary, analyses were drifting beyond the allowable limit. Where data for system linearity was available, it was shown to be noncompliant. Degradation calculations were not available, but visual inspection of the standard chromatograms indicate breakdown over the 20% allowable limit. Continuing calibration standards were not monitored for consistency, and inspection shows most to have %Differences of more than 50% (allowable limit of 15%). These violations reflect an inconsistent analysis system, and quantitative values generated from this processing must all be considered estimated. The qualitative identification, with the exception of the Aroclors discussed below, and most detection limit values are not affected. However, it should be noted that protocol requires the 15 % Difference limit to be adhered to even for a judgement as to presence/absense of a component.

Protocol requires that a standard be run every 5 samples in order to verify system integrity. Aqueous samples were processed sequentially for more than 40 analysis runs without a standard interspersed. All aqueous reported quantitative values should be considered estimated.

Because 4,4'-DDT and 4,4'-DDE are indistinguishable from some of the Aroclor components on both GC columns utilized in this project, samples that contain Aroclor mixtures have inconclusive results for DDT and DDE. It is not possible in those cases to determine if those two compounds are present and masked by the Aroclor PCBs. Attached results forms have been edited during validation where appropriate.

Although required by protocol, confirmation GC analyses were not always performed when PCBs were detected and reported. Pattern recognition was utilized to confirm presence.

Due to the complexity of PCB components, and the degradation that can occur over time in the field, it is often difficult to resolve the exact nature and proportion of the Aroclor mixtures detected in samples. Most samples analysed for this project that had PCBs present that were identified and reported by the laboratory as Aroclor 1260. Some samples processed in a certain timeframe were identified as Aroclor 1254. Because the validator believes that Aroclor 1260 is a more accurate characterization of the sample components, those previously reported as Aroclor 1254 have been recalculated and reported as Aroclor 1260 in this report. Appropriate edits have been made to the attached results forms.

In addition to the change in Aroclor identity, other changes have been made in the laboratory reported PCB results during this data review. Some target compounds had not been reported although they were actually present, and some calculation errors had resulted in incorrect reported values.

No method blanks were processed on the confirmation column. Some blanks indicated a presence of endosulfate on the primary column, and were not run for confirmation. Because samples did not contain endosulfate, there was no effect on reported results.

As with the BNA analyses, the holding time of 5 days for extraction was utilized only for the start of the extraction, and extracts were held up to 11 days before concentration. PCB/Pesticide results are already flagged as estimated due to concerns discussed above.

Surrogate and matrix spike recoveries for the samples are within recommended range with the exception of one soil matrix spike duplicate percent difference.

PCB-ONLY ANALYSES

All quality concerns mentioned above in the pesticide/PCB section apply to the PCB-only analyses as well. Calculation corrections, appropriate qualifiers, and Aroclor identity edits have been made to the attached results forms. The detection limits of the oil samples have also been changed to reflect the actual dilution level of the samples. Sample S-84(0-2) produced a chromatogram too dirty to provide conclusive results at the submitted dilution. It should have been flagged as inconclusive.

As with other organic extracts, some of the PCB extracts were held up to twelve days between extraction and concentration. Because the reported results for PCBs in this project are considered estimated due to standard and system noncompliancies, no additional flagging was required as a result of this finding.

The method blank for soil samples extracted 10/31/90 contained Aroclor 1260 at a level of 191 ug/kg, although it was not reported as such. PCB data for all samples associated with that method blank, S-67(0-2), S-68(0-2), MW-17(0-2), S-6(0-2), S-1(0-2), and S-1(2-3), are consequently considered unusable.

METALS ANALYSES

Protocol was followed in part for the metals processing, but the report forms were not flagged with the required QC qualifiers, and have been edited upon validation. The most common omissions were the "N" flag for spike recovery out of range, "*" for inconsistent duplicate results, "W" indicating that the post-digest spike for graphite furnace (GFAA) analyses did not recover within a 85-115% range, and "B" to indicate that the reported value is higher than the instrument detection limit, but less than the contract required detection limit (CRDL).

General noncompliancies in the metals analysis include failure to repeat method blanks, Laboratory Control Samples, and some samples when the post digest spike of GFAA elements were not within required range.

It is of note that lead and chromium were detected in the field blanks and trip blanks at levels above CRDL and comparable with other sample reported results. The source of the lead and chromium in these blanks is not known, and provides concern regarding other sample results for these elements. The method blanks did not contain levels above CRDL for these elements. However, standards at CRDL analyzed for lead did not produce good recovery, and in fact produced values similar to those in the method blanks.

Holding times for mercury analysis were violated in samples S-43(0-2), S-53(5-7), and S-41A(3.5-5.5), having been processed 6-8 days over the allowable holding time of 28 days.

Some sample results have been changed as a result of review, including the calcium results of sample MW-23, which should have been reported as 70,300 ug/l rather than 10,300 ug/l.

The method blank associated with the selenium analysis of samples MW-33, MW-32, and MW-29 produced values above the CRDL, and the samples should have been redigested and analysed. They were not, and the reported value for MW-33 is considered unusable.

The chromium analysis of sample S-38(2-4) should have been repeated due to inconsistent results during analysis, and its reported result is considered unusable.

The reported nickel result for sample MW-26(9-11) is actually that of the sample duplicate run at the same time. The original MW-26(9-11) data was not used because its duplicate injection precision was not met.

Sample MW-33 produced inconsistent lead results during multiple analyses.

Matrix spike recoveries for the aqueous samples were out of preferred limits for aluminum (0% recovery), selenium (29% rec.), lead (168% rec.), thallium (189% rec), and manganese (66% rec.). Soil matrix spike recovery outliers were antimony at 63%, chromium at 38%, and selenium at 59%. Mercury recovery data for soil matrix spikes was not included in the data package.

Samples S-60(4-6) amd S-33(4-6) were not processed in compliance with protocol. No post-digest spikes were performed for antimony, arsenic, chromium, lead, silver, or thallium. Consequently reported results for these elements must be considered estimated. No method blank appears on the ICP digestion log for these samples. Therefore potential procedural contamination cannot be eliminated for those elements, and the reported results will also be considered estimated. Additionally, the Laboratory Control Sample produced a recovery out of range for antimony, and the samples should have been redigested and reanalyzed for that element.

TOTAL PETROLEUM HYDROCARBON (TPH) ANALYSES

The holding time of 28 days for TPH analysis indicated in the Work Plan was violated for the samples indicated on the attached compliancy charts. Those samples were extracted two and three months after sample receipt, and the results and detection limits should be considered biased low.

Standards, both multipoint and as continuing calibrations, were analysed periodically throughout the sample processing. The IR system was not linear in some cases, and sample results were calculated by comparison with a standard in the same range. Due to the nonlinear nature of the system, quantitation inaccuracies should be taken into account when evaluating sample and method blank data near the detection limit.

Although the reported detection limit for the soils is 10 mg/kg, only three of the fourteen soil method blanks processed with the samples produced results less than that value. The others ranged from 18 to 234 mg/kg. The cause of the detected blank levels is not known. It occurs primarily in the soil matrix, which can be due to a matrix extraction contribution. However, the same aqueous blank extract produced different readings when run twice, which can imply inconsistencies in the analysis procedures. The reported sample results for the TPHs had been corrected for the associated method blank level. That is to say, when a method blank produced a reading above the CRDL, the blank value was subtracted from each associated sample. Because the cause of the blank "contamination" is not known, its applicablity to sample results is not predictable. Protocol does not outline specific criteria for TPH method blanks. Samples in this project with values near the detection limit and samples which were run at a dilution have values that are suspect due to the blank value subtraction. In addition, samples that have been reported as <10 mg/kg may have shown a real value, but one less than its method blanks. As a result of these sometimes nonreproducible blank values, all TPH values should be considered estimated, and not accurate beyond two significant figures. The attached forms reflect corrections determined by validation.

Sample S-65(0-2) was extracted using only 15 rather than 30 grams, and its result should have been reported as 4300 mg/kg.

Insufficient data was available to verify TPH results for samples MW-25(6-8) and MW-24(15-17).

Matrix spikes were performed for the TPH analysis. Recoveries ranged between 43 and 243%, with most falling between 60 and 160%. Recommended criteria have not been established for TPH matrix spikes.

TOTAL ORGANIC CARBON

Sample MW-16(6-8) was to have been analysed for TOC. About 90 days after sample receipt, which is beyond the 28 day allowable limit, the sample was processed for % moisture at 103 deg C. and total solids at 550 deg C. A calculation was made to determine the difference in these two parameters for a total volatile solid figure. This statistic is not generated in compliance with methodology for total organic carbon.

COMPLIANCY SUMMARY

Project: National Railroad Passenger Corporation
Sunnyside Yard, Queens, NY

Rec Date	Spl ID	Matrix	VOA	BNA	Pest/PCB	PCB ONLY	Metals	TPH	Noncompl.
10-03-90	S-85	Soil	NR	NR	NR	NR	NR	OK	
10-03-90	S-86	Soil	NR	NR	NR	NR	NR	OK	
10-03-90	S-87	Soil	NR	NR	NR	NR	NR	OK	
10-03-90	S-88	Soil	NR	NR	NR	NR	NR	OK	
10-03-90	S-89	Soil	NR	NR	NR	NR	NR	OK	
10-03-90	S-90	Soil	OK	NO	NO	NR	OK	OK	1,2
10-03-90	S-91	Soil	NR	NR	NR	NR	NR	OK	
10-03-90	S-92	Soil	NR	NR	NR	NR	NR	OK	
10-03-90	S-27	Soil	NR	NR	NR	NR	NR	OK	
10-05-90	S-29(0-2)	Soil	NR	NR	NR	NR	NR	OK	
10-05-90	S-79(0-2)	Soil	NR	NR	NR	NR	NR	OK	
10-05-90	S-80 0-2	Soil	NR	NR	NR	NR	NR	OK	
10-05-90	S-80 2-4	Soil	OK	OK	NO	NR	OK	NR	1
10-05-90	MW-32 0-2	Soil	NR	NR	NR	NR	NR	OK	
10-05-90	S-71 0-2	Soil	NR	NR	NR	NR	NR	OK	
10-05-90	S-71 6-8	Soil	NR	NR	NR	NR	NR	OK	
10-05-90	S-70 0-2	Soil	NR	NR	NR	NR	NR	OK	
10-05-90	S-70 6-8	Soil	NR	NR	NR	NR	NR	OK	
10-05-90	S-72 0-2	Soil	NR	NR	NR	NR	NR	OK	
10-05-90	S-72 6-8	Soil	NR	NR	NR	NR	NR	OK	
10-05-90	S-73 0-2	Soil	NR	NR	NR	NR	NR	OK	

Rec Date	Spl ID	Matrix	VOA	BNA	Pest/PCB	PCB ONLY	Metals	TPH	Noncompl.
10-0?-90	S-21 0-2	Soil	NR	NR	NR	NR	NR	OK	
10-0?-90	S-21 6-8	Soil	NR	NR	NR	NR	NR	OK	
10-0?-90	S-23 0-2	Soil	NR	NR	NR	NR	NR	OK	
10-0?-90	S-23 8-10	Soil	NR	NR	NR	NR	NR	OK	
10-10-90	S-24 0-2	Soil	NR	NR	NR	NR	NR	NO	11
10-10-90	S-24 9-11	Soil	NR	NR	NR	NR	NR	NO	11
10-10-90	S-74 0-2	Soil	NR	NR	NR	NO	NR	NO	1,11
10-10-90	S-74 6-8	Soil	NR	NR	NR	NR	NR	NO	11
10-10-90	S-74 12-14	Soil	NR	NR	NR	NR	NR	NO	11
10-10-90	S-77 0-2	Soil	NR	NR	NR	NO	NR	NO	1,11
10-10-90	S-77 13-15	Soil	NR	NR	NR	NR	NR	NO	11
10-10-90	S-75 0-2	Soil	NR	NR	NR	NO	NR	NO	1,11
10-10-90	S-81 0-2	Soil	NR	NR	NR	NR	NR	NO	11
10-10-90	S-28 0-2	Soil	NR	NR	NR	NR	NR	NO	11
10-12-90	S-3 0-2	Soil	NR	NR	NR	NO	NR	OK	1
10-12-90	S-4 0-2	Soil	NR	NR	NR	NO	NR	OK	1
10-12-90	S-9 0-2	Soil	NR	NR	NR	NO	NR	OK	1
10-12-90	S-66 0-2	Soil	NR	NR	NR	NR	NR	OK	
10-12-90	S-69 0-2	Soil	NR	NR	NR	NR	NR	OK	
10-12-90	S-3 3-5	Soil	NR	NR	NR	NO	NR	NR	1
10-12-90	S-9 3-4.5	Soil	NR	NR	NR	NO	NR	NR	1
10-12-90	S-66 3-5	Soil	NR	NR	NR	NO	NR	NR	1
10-16-90	S-54 0-2	Soil	NR	NR	NR	NR	NR	OK	
10-16-90	S-54 7-9	Soil	NR	NR	NR	NR	NR	OK	
10-16-90	S-55 0-2	Soil	NR	NR	NR	NR	NR	OK	

Rec Date	Spl ID	Matrix	VOA	BNA	Pest/PCB	PCB ONLY	Metals	TPH	Noncompl.
10-16-90	S-55 7-9	Soil	NR	NR	NR	NR	NR	OK	
10-16-90	S-56 0-2	Soil	NR	NR	NR	NR	NR	OK	
10-16-90	S-56 7-9	Soil	NR	NR	NR	NR	NR	OK	
10-18-90	S-82 0-2	Soil	OK	NO	NO	NR	OK	OK	1,8
10-18-90	S-82 6-8	Soil	NR	NR	NR	NR	NR	OK	
10-18-90	S-30 0-2	Soil	OK	NO	NO	NR	OK	OK	1,8
10-18-90	S-30 4-6	Soil	NR	NR	NR	NR	NR	OK	
10-18-90	S-10 0-2	Soil	NR	NR	NR	NO	Pb-OK	OK	1
10-18-90	S-59 0-2	Soil	NR	NR	NR	NO	NR	OK	1
10-18-90	S-58 0-2	Soil	NR	NR	NR	NR	NR	OK	
10-18-90	S-40 0-2	Soil	NR	NR	NR	NR	NR	OK	
10-18-90	S-22 0-2	Soil	OK	NO	NO	NR	OK	OK	1,8
10-18-90	S-31 0-2	Soil	NR	NR	NR	NO	NR	OK	1
10-18-90	S-84 0-2	Soil	NR	NR	NR	NO	NR	OK	1,10
10-18-90	S-83 0-2	Soil	NR	NR	NR	NO	NR	OK	1
10-19-90	S-94 0-2	Soil	NR	NR	NR	NR	NR	NO	11
10-19-90	S-94 2-3	Soil	NR	NR	NR	NO	NR	NR	1
10-19-90	S-93 0-2	Soil	NR	NR	NR	NR	NR	NO	11
10-19-90	S-93 18-20	Soil	NR	NR	NR	NR	NR	NO	11
10-19-90	S-25 0-2	Soil	NR	NR	NR	NR	NR	CA	cancelled
10-19-90	S-95 0-2	Soil	NR	NR	NR	NR	NR	NO	11
10-19-90	S-64 0-2	Soil	NR	NR	NR	NR	NR	NO	11
10-19-90	S-64 2-3	Soil	OK	OK	NO	NR	OK	NR	1
10-20-90	S-17 0-2	Soil	OK	OK	NO	NR	OK	OK	1
10-20-90	S-49 0-2	Soil	NR	NR	NR	NR	NR	OK	

Rec Date	Spl ID	Matrix	VOA	BNA	Pest/PCB	PCB ONLY	Metals	TPH	Noncompl.
10-20-90	S-49 2-4	Soil	OK	OK	NO	NR	OK	NR	1
10-20-90	S-49 4-6	Soil	NR	NR	NR	NR	NR	OK	
10-20 90	S-49 8-10	Soil	NR	NR	NR	NR	NR	OK	
10-20-90	S-48 0-2	Soil	NR	NR	NR	NR	NR	OK	
10-20-90	S-48 2-4	Soil	NR	NR	NR	NR	NR	OK	
10-20-90	S-48 11-13	Soil	NR	NR	NR	NR	NR	OK	
10-20-90	S-47 0-2	Soil	NR	NR	NR	NR	NR	OK	
10-20-90	S-47 2-4	Soil	OK	OK	NO	NR	OK	NR	1
10-20-90	S-47 7-9	Soil	NR	NR	NR	NR	NR	OK	
10-20-90	S-47 11-13	Soil	NR	NR	NR	NR	NR	OK	
10-22-90	MW-22 0-2	Soil	NR	NR	NR	NO	NR	OK	1
10-22-90	MW-13 0-2	Soil	NR	NR	NR	NO	NR	OK	1
10-26-90	S-2 0-2	Soil	NR	NR	NR	NO	Pb-OK	OK	1
10-26-90	S-65 0-2	Soil	NR	NR	NR	NR	NR	OK	
10-26-90	S-62 0-2	Soil	OK	OK	NO	NR	OK	OK	1
10-26-90	S-61 0-1.1	Soil	NR	NR	NR	NR	NR	OK	
10-26-90	S-61 5-7	Soil	OK	OK	NO	NR	OK	NR	1
10-26-90	S-63 0-2	Soil	NR	NR	NR	NO	NR	OK	1
10-26-90	S-7 0-2	Soil	NR	NR	NR	NO	NR	OK	1
10-26-90	S-8 0-2	Soil	NR	NR	NR	NO	NR	OK	1
10-26-90	S-76 0-0.7	Soil	NR	NR	NR	NO	NR	OK	1
10-29-90	S-67 0-2	Soil	NR	NR	NR	NO	NR	OK	1,4
10-29-90	S-68 0-2	Soil	NR	NR	NR	NO	NR	OK	1,4
10-29-90	S-45 0-2	Soil	NR	NR	NR	NR	NR	OK	
10-29-90	S-45 2-4	Soil	NR	NR	NR	NR	NR	OK	

Rec Date	Spl ID	Matrix	VOA	BNA	Pest/PCB	PCB ONLY	Metals	TPH	Noncompl.
10-29-90	S-1 0-2	Soil	NR	NR	NR	NO	NR	OK	1,4
10-29-90	S-1 2-3	Soil	NR	NR	NR	NO	NR	OK	1,4
10-29-90	MW-17 0-2	Soil	NR	NR	NR	NO	NR	OK	1,4
10-29-90	S-5 0-2	Soil	NR	NR	NR	NO	NR	OK	1,4
11-07 90	S-44 0-2	Soil	NR	NR	NR	NR	NR	OK	
11-07-90	S-44 4-6	Soil	NR	NR	NR	NR	NR	OK	
11-07-90	S-43 0-2	Soil	OK	OK	NO	NR	NO	OK	1,3
11-07-90	S-41 0-2	Soil	NR	NR	NR	NR	NR	OK	
11-07-90	S-42 0-2	Soil	NR	NR	NR	NR	NR	OK	
11-07-90	S-41 2-4	Soil	NR	NR	NR	NR	NR	OK	
11-09-90	MW-31 0-2	Soil	NR	NR	NR	NO	Pb-OK	OK	1
11-09-90	MW-31 10l2	Soil	NR	NR	NR	NR	NR	OK	
11-09-90	MW-16 0-2	Soil	NR	NR	NR	NO	NR	OK	1
11-09-90	MW-16 6-8	Soil	NR	NR	NR	NR	NR	NR	TOC-NO 9
11-09-90	MW-16 10l2	Soil	NR	NR	NR	NO	NR	NR	1
11-09-90	S-41A(3-5)	Soil	OK	NO	NO	NR	NO	NR	1,3,13
11-09-90	S-46 0-2	Soil	NR	NR	NR	NR	NR	OK	
11-09-90	S-46 7-9	Soil	NR	NR	NR	NR	NR	OK	
11-10-90	MW-28 0-2	Soil	NR	NR	NR	NR	NR	OK	
11-10-90	MW-28 6-8	Soil	NR	NR	NR	NR	NR	OK	
11-12-90	S-50 0-2	Soil	NR	NR	NR	NO	NR	OK	1
11-12-90	S-51 0-2	Soil	NR	NR	NR	NO	NR	OK	1
11-12-90	S-52 0-2	Soil	NR	NR	NR	NO	NR	OK	1
11-12-90	S-52 10-12	Soil	NR	NR	NR	NR	NR	OK	
11-12-90	S-51 12-14	Soil	NR	NR	NR	NR	NR	OK	

Rec Date	Spl ID	Matrix	VOA	BNA	Pest/PCB	PCB ONLY	Metals	TPH	Noncompl.
11-13-90	S-6 0-2	Soil	NR	NR	NR	NO	NR	OK	1
11-13-90	S-6 8-9	Soil	NR	NR	NR	NR	NR	OK	
11-13-90	S-16 0-2	Soil	NR	NR	NR	NO	NR	OK	1
11-13-90	S-16 10-12	Soil	NR	NR	NR	NR	NR	OK	
11-13-90	S-20 0-2	Soil	NR	NR	NR	NR	NR	OK	
11-17-90	MW-23 9-11	Soil	NR	NR	NR	NR	NR	OK	
11-19-90	MW-29 0-2	Soil	NR	NR	NR	NR	NR	OK	
11-19-90	S-34 0-2	Soil	NR	NR	NR	NO	Pb-OK	OK	1
11-19-90	S-26 0-2	Soil	NR	NR	NR	NO	Pb-OK	OK	1
11-19-90	S-26 4-6	Soil	NR	NR	NR	NR	NR	OK	
11-19-90	MW-25 0-2	Soil	NR	NR	NR	NR	NR	OK	
11-19-90	MW-25 4-6	Soil	OK	OK	NO	NR	OK	NR	1
11-19-90	MW-25 6-8	Soil	NR	NR	NR	NR	NR	NO	12
11-28-90	S-78 0-2	Soil	NR	NR	NR	NO	NR	OK	1
12-13-90	S-78 8-9	Soil	NR	NR	NR	NO	NR	NR	1
11-28-90	S-60 0-2	Soil	NR	NR	NR	NR	NR	OK	
12-13-90	S-60 4-6	Soil	OK	OK	NO	NR	NO	NR	5
11-28-90	S-57 0-2	Soil	NR	NR	NR	NR	NR	OK	
11-20-90*	MW-33 0-2	Soil	NR	NR	NR	NR	NR	NP	
11-20-90*	MW-33 8-10	Soil	NR	NR	NR	NR	NR	NP	
11-21-90	S-53 0-2	Soil	NR	NR	NR	NO	NR	NO	1,11
11-21-90	S-53 3-5	Soil	NR	NR	NR	NO	NR	NR	1
11-21-90	S-53 5-7	Soil	OK	OK	NO	NR	NO	NR	1,3
11-21-90	S-53 8-10	Soil	NR	NR	NR	NR	NR	NO	11

* Samples received 6 days after collection, and were not processed.

Rec Date	Spl ID	Matrix	VOA	BNA	Pest/PCB	PCB ONLY	Metals	TPH	Noncompl.
11-28-90	MW-24 0-2	Soil	NR	NR	NR	NR	NR	OK	
11-30-90	MW-34 0-2	Soil	OK	NO	NO	NR	OK	OK	1,8
11-30-90	MW-34 10l2	Soil	NR	NR	NR	NR	NR	OK	
11-30-90	S-38 0-2	Soil	NR	NR	NR	NR	NR	OK	
11-30-90	S-38 2-4	Soil	OK	NO	NO	NR	OK	NR	1,8
11-30-90	S-38 10-12	Soil	NR	NR	NR	NR	NR	OK	
11-30-90	S-38 12-14	Soil	NR	NR	NR	NR	NR	OK	
11-30-90	S-39 0-2	Soil	NR	NR	NR	NR	NR	OK	
11-30-90	S-39 2-4	Soil	OK	NO	NO	NR	OK	NR	1,8
11-30-90	S-39 8-10	Soil	NR	NR	NR	NR	NR	OK	
11-30-90	MW-24 1517	Soil	NR	NR	NR	NR	NR	NO	12
12-01-90	MW-30 0-2	Soil	NR	NR	NR	NO	NR	OK	1
12-01-90	MW-30 6-8	Soil	NR	NR	NR	NR	NR	OK	
12-01-90	MW-30 1113	Soil	NR	NR	NR	NR	NR	OK	
12-01-90	S-35 0-2	Soil	NR	NR	NR	NR	NR	OK	
12-01-90	S-35 8-10	Soil	OK	NO	NO	NR	OK	NR	1,8
12-03 90	S-36 0-2	Soil	NR	NR	NR	NO	Pb-OK	OK	1
12-03-90	S-36 6-8	Soil	NR	NR	NR	NR	NR	OK	
12-03-90	S-37 0-2	Soil	NR	NR	NR	NR	NR	OK	
12-03-90	S-37 4-6	Soil	OK	NO	NO	NR	OK	NR	1,8
12-03-90	S-37 8-10	Soil	NR	NR	NR	NR	NR	OK	
12-03-90	S-37 14-16	Soil	NR	NR	NR	NR	NR	OK	
12-03-90	MW-27 0-2	Soil	NR	NR	NR	NR	NR	OK	
12-03-90	MW-27 7-9	Soil	NR	NR	NR	NR	NR	OK	
12-03-90	MW-27 1416	Soil	NR	NR	NR	NR	NR	OK	

Rec Date	Spl ID	Matrix	VOA	BNA	Pest/PCB	PCB ONLY	Metals	TPH	Noncompl.
12-06-90	S-32 0-2	Soil	NR	NR	NR	NO	Pb-OK	OK	1
12-06-90	S-19 0-2	Soil	NR	NR	NR	NR	NR	OK	
12-06-90	S-25 0-2	Soil	NR	NR	NR	NR	NR	OK	
12-06-90	S-25 12-14	Soil	NR	NR	NR	NR	NR	OK	
12-06-90	S-25 19-21	Soil	NR	NR	NR	NR	NR	OK	
12-06 90	MW-26 0-2	Soil	NR	NR	NR	NR	NR	OK	
12-06-90	S-19 9-11	Soil	NR	NR	NR	NR	NR	OK	
12-06-90	MW-26 9-11	Soil	OK	NO	NO	NR	OK	NR	1,2,8
12-06-90	MW-26 1214	Soil	NR	NR	NR	NR	NR	OK	
12-08-90	MW-21 0-2	Soil	NR	NR	NR	NO	Pb-OK	OK	1
12-08-90	MW-19 0-2	Soil	NR	NR	NR	NO	Pb-OK	OK	1
12-13-90	MW-20 0-2	Soil	NR	NR	NR	NO	Pb-OK	OK	1
12-14-90	S-33 0-2	Soil	NR	NR	NR	NR	NR	OK	
12-14-90	S-33 4-6	Soil	OK	OK	NO	NR	NO	NR	1,5

Rec Date	Spl ID	Matrix	VOA	BNA	Pest/PCB	PCB ONLY	Metals	TPH	Noncompl.
10-29-90	WM	Aqueous	NR	NR	NR	NO	NR	NR	1,4
11-09-90	S-41 A	Aqueous	OK	NR	NR	NR	NR	NR	
11-17-90	UST-1	Aqueous	OK	NR	NR	NR	NR	NR	
10-10-90	FB-1-SS	Aqueous	OK	NR	NR	NR	NR	NR	
10-10-90	FB-2-PD	Aqueous	OK	NR	NR	NR	NR	NR	
10-10-90	TB-1	Aqueous	OK	NR	NR	NR	NR	NR	
10-18-90	FB-3-SS	Aqueous	OK	NR	NR	NR	NR	NR	
10-18-90	FB-4-PD	Aqueous	OK	NR	NR	NR	NR	NR	
10-18-90	TB-2	Aqueous	OK	NR	NR	NR	NR	NR	
10-29-90	FB-5-SS	Aqueous	OK	NR	NR	NR	NR	NR	
10-29-90	FB-6-PD	Aqueous	OK	NR	NR	NR	NR	NR	
10-29-90	TB-3	Aqueous	OK	NR	NR	NR	NR	NR	
11-07-90	FB-7-SS	Aqueous	OK	NR	NR	NR	NR	NR	
11-07-90	FB-8-PD	Aqueous	OK	NR	NR	NR	NR	NR	
11-07-90	TB-4	Aqueous	OK	NR	NR	NR	NR	NR	
12-03-90	FB-9-SS	Aqueous	OK	NR	NR	NR	NR	NR	
12-03-90	FB-10-PD	Aqueous	OK	NR	NR	NR	NR	NR	
12-03-90	TB-5	Aqueous	OK	NR	NR	NR	NR	NR	

Rec Date	Spl ID	Matrix	VOA	BNA	Pest/PCB	PCB ONLY	Metals	TPH	Noncompl.
1-04-91	MW-32	Aqueous	OK	OK	NO	NR	NO	OK	1,6
1-04-91	MW-26	Aqueous	OK	NO	NO	NR	OK	OK	1,2
1-04-91	MW-29	Aqueous	OK	NO	NO	NR	NO	OK	1,2,6
1-05-91	MW-19	Aqueous	OK	OK	NO	NR	OK	OK	1
1-05-91	MW-25	Aqueous	OK	NO	NO	NR	OK	OK	1,7
1-08-91	MW-13	Aqueous	OK	OK	NO	NR	OK	OK	1
1-08-91	MW-23	Aqueous	OK	OK	NO	NR	OK	OK	1
1-08-91	MW-1	Aqueous	OK	NO	NO	NR	OK	OK	1,7
1-08-91	MW-9	Aqueous	OK	NO	NO	NR	OK	OK	1,2
1-05-91	MW-33	Aqueous	OK	OK	NO	NR	NO	OK	1,6
1-04-91	TB-1	Aqueous	OK	OK	NO	NR	OK	OK	1
1-05-91	TB-2	Aqueous	OK	OK	NO	NR	OK	OK	1
1-08-91	TB-3	Aqueous	OK	OK	NO	NR	OK	OK	1
1-04-91	FB-1	Aqueous	OK	OK	NO	NR	OK	OK	1
1-05-91	FB-2	Aqueous	OK	OK	NO	NR	OK	OK	1
1-08-91	FB-3	Aqueous	OK	NO	NO	NR	OK	OK	1,2
1-05-91	REP-3	Aqueous	OK	OK	NO	NR	OK	NR	1
1-04-91	MW-28	Aqueous	NR	OK	NO	NR	NR	NR	1
1-04-91	MW-28*	Aqueous	OK	NR	NR	NR	OK	OK	
1-08-91	Tank 1	Aqueous	NR	NR	NR	NO	NR	NR	1
1-08-91	Tank 2	Aqueous	NR	NR	NR	NO	NR	NR	1

* MW-28 submitted as two different sample identification numbers.

Rec Date	Spl ID	Matrix	VOA	BNA	Pest/PCB	PCB ONLY	Metals	TPH	Noncompl.
2-22-91	MW-3	Aqueous	NR	NR	NR	NO	NR	NR	1
1-08-91	MW-5	Aqueous	NR	NR	NR	NO	NR	NR	1
1-08-91	MW-7	Aqueous	NR	NR	NR	NO	NR	NR	1
1-08-91	MW-16	Aqueous	NR	NR	NR	NO	NR	NR	1
1-08-91	MW-17	Aqueous	NR	NR	NR	NO	NR	NR	1
1-08-91	MW-20	Aqueous	NR	NR	NR	NO	NR	NR	1
1-04-91	MW-30	Aqueous	NR	NR	NR	NO	NR	OK	1
1-04-91	MW-34	Aqueous	NR	NR	NR	NO	NR	OK	1
1-04-91	MW-24	Aqueous	NR	NR	NR	NO	NR	OK	1
1-05-91	MW-21	Aqueous	NR	NR	NR	NO	NR	OK	1
1-05-91	MW-27	Aqueous	NR	NR	NR	NO	NR	OK	1
1-05-91	MW-31	Aqueous	NR	NR	NR	NO	NR	OK	1
1-08-91	MW-22	Aqueous	NR	NR	NR	NO	NR	OK	1
1-05-91	REP-1	Aqueous	NR	NR	NR	NO	NR	OK	1
1-05-91	REP-2	Aqueous	NR	NR	NR	NO	NR	OK	1
1-08-91	REP-4	Aqueous	NR	NR	NR	NO	NR	OK	1

1. PCB analysis noncompliant due to standard linearity, reproducibility, breakdown and retention time criteria failures. No confirmation performed for any method blanks, and for some PCB hits. 4,4'-DDT and 4,4'-DDE inconclusive in samples with PCBs detected.
2. Holding time exceeded for BNA extraction.
3. Holding time exceeded for mercury analysis.
4. Unusable PCB data due to presence of Aroclor 1260 greater than CRDL in the method blank.
5. PDSs not performed for Sb, As, Cr, Ag, Tl; method blank not performed with ICP digestion; LCS value for antimony out of acceptable range.
6. Selenium detected in method blank above CRDL.
7. BNA sample analysis should have been repeated due to noncompliant surrogate recovery.
8. Associated BNA method blank has surrogate recovery out of acceptable range.
9. TOC analysis not according to protocol.
10. Inconclusive PCB result due to chromatographic interferences.
11. Holding time exceeded for TPH extraction/analysis.
12. Insufficient raw data to validate TPH result.
13. BNA analysis occured beyond allowable 12 hour timeframe from instrument tune.

APPENDIX G

Water Sampling Logs

ROUX Consulting Ground-Water Geologists
ROUX ASSOCIATES INC

WELL SAMPLING DATA FORM

CLIENT Amoco
PROJECT NO. 058094
LOCATION Sunnyside #1

WELL NUMBER Recovery Tank -2
DATE 11/2/94
WEATHER Overcast - COLD
SAMPLED BY AG., PB.

TYPE OF WELL
STORAGE TANK Steel - Above Ground
TIME OF START
TIME OF FINISH

DEPTH TO BOTTOM OF WELL		FT.
DEPTH TO WATER		FT.
WATER COLUMN		FT.
VOLUME OF WATER IN WELL		GAL.
VOLUME OF WATER TO REMOVE		GAL.
VOLUME REMOVED		GAL.

RATE OF PURGE
METHOD OF PURGE

PHYSICAL APPEARANCE/COMMENTS
0.26' of product, 4.55' down from M.P. (Top of Stickup). Stickup 0.85' above top of Vand. — sampled water

FIELD MEASUREMENTS

TIME	pH	COND	TEMP	TURB	Eh	O^2

TYPES OF SAMPLES COLLECTED

PCB
(WATER)

LABORATORY NAME AND LOCATION

Enviro systems Inc
Columbia, Md.

ROUX Consulting Ground-Water Geologists
ROUX ASSOCIATES INC

WELL SAMPLING DATA FORM

CLIENT AMTRAK
PROJECT NO. 055094
LOCATION Sunnyside Yd

WELL NUMBER Recovery tank - 1
DATE 1/7/94
WEATHER Overcast - cold
SAMPLED BY HG, P.B.

TYPE OF WELL STORAGE TANK Steel - Above Ground
TIME OF START
TIME OF FINISH

DEPTH TO BOTTOM OF WELL		FT.
DEPTH TO WATER		FT.
WATER COLUMN		FT.
VOLUME OF WATER IN WELL		GAL.
VOLUME OF WATER TO REMOVE		GAL.
VOLUME REMOVED		GAL.

RATE OF PURGE
METHOD OF PURGE

PHYSICAL APPEARANCE/COMMENTS
2.36' of product, 3.4' down from M.P. (top of Stick up). Stickup 0.85' above top of tank. — Sampled Product

FIELD MEASUREMENTS

TIME	pH	COND	TEMP	TURB	Eh	O^2

TYPES OF SAMPLES COLLECTED

PCB / S.G. / K.V.
(Oil)

LABORATORY NAME AND LOCATION

Enviro Systems Inc
Columbia Md.

ROUX Consulting Ground-Water Geologists
ROUX ASSOCIATES INC

WELL SAMPLING DATA FORM

CLIENT Am Trak
PROJECT NO. 055094
LOCATION Sunnyside Rd

WELL NUMBER Field Blank K-1
DATE 1/3/91
WEATHER _____
SAMPLED BY _____

TYPE OF WELL _____
STORAGE TANK _____
TIME OF START _____
TIME OF FINISH _____

DEPTH TO BOTTOM OF WELL _____ FT.
DEPTH TO WATER _____ FT.
WATER COLUMN _____ FT.
VOLUME OF WATER IN WELL _____ GAL.
VOLUME OF WATER TO REMOVE _____ GAL.
VOLUME REMOVED _____ GAL.

RATE OF PURGE _____
METHOD OF PURGE _____

PHYSICAL APPEARANCE/COMMENTS

FIELD MEASUREMENTS

TIME	pH	COND	TEMP	TURB	Eh	O^2

TYPES OF SAMPLES COLLECTED

LABORATORY NAME AND LOCATION

ROUX Consulting Ground-Water Geologists
ROUX ASSOCIATES INC

WELL SAMPLING DATA FORM

CLIENT AMTRAK
PROJECT NO. 055094
LOCATION Sunnyside Yd.

WELL NUMBER Field Blank -2
DATE 1/4/91
WEATHER
SAMPLED BY

TYPE OF WELL
STORAGE TANK
TIME OF START
TIME OF FINISH

DEPTH TO BOTTOM OF WELL ____ FT.
DEPTH TO WATER ____ FT.
WATER COLUMN ____ FT.
VOLUME OF WATER IN WELL ____ GAL.
VOLUME OF WATER TO REMOVE ____ GAL.
VOLUME REMOVED ____ GAL.

RATE OF PURGE
METHOD OF PURGE

PHYSICAL APPEARANCE/COMMENTS

FIELD MEASUREMENTS

TIME	pH	COND	TEMP	TURB	Eh	O^2

TYPES OF SAMPLES COLLECTED

LABORATORY NAME AND LOCATION

ROUX Consulting Ground-Water Geologists
ROUX ASSOCIATES INC

WELL SAMPLING DATA FORM

CLIENT Amtech
PROJECT NO. 055094
LOCATION Sunnyside Gdns

WELL NUMBER Field Blank -3
DATE 1/7/91
WEATHER
SAMPLED BY AG.

TYPE OF WELL
STORAGE TANK
TIME OF START
TIME OF FINISH

DEPTH TO BOTTOM OF WELL _____ FT.
DEPTH TO WATER _____ FT.
WATER COLUMN _____ FT.
VOLUME OF WATER IN WELL _____ GAL.
VOLUME OF WATER TO REMOVE _____ GAL.
VOLUME REMOVED _____ GAL.

RATE OF PURGE
METHOD OF PURGE

PHYSICAL APPEARANCE/COMMENTS

FIELD MEASUREMENTS

TIME	pH	COND	TEMP	TURB	Eh	O^2
	7.88	-10	6°C			

TYPES OF SAMPLES COLLECTED

LABORATORY NAME AND LOCATION

ROUX Consulting Ground-Water Geologists
ROUX ASSOCIATES INC

WELL SAMPLING DATA FORM

CLIENT Amtrak
PROJECT NO. 05509Y
LOCATION Amtrak - Sunnyside Monitoring

WELL NUMBER MW-1
DATE 2/7/91
WEATHER Cloudy, Cold ≈ 35°F
SAMPLED BY C.Z, D.S.

TYPE OF WELL 2" [redacted]
STORAGE TANK
TIME OF START 15:15
TIME OF FINISH 16:00

DEPTH TO BOTTOM OF WELL	12.50	FT.
DEPTH TO WATER	6.20	FT.
WATER COLUMN	6.30	FT.
VOLUME OF WATER IN WELL	1.00	GAL.
VOLUME OF WATER TO REMOVE	3.00	GAL.
VOLUME REMOVED	3.00	GAL.

RATE OF PURGE
METHOD OF PURGE Bailer

PHYSICAL APPEARANCE/COMMENTS
Brown, silty

FIELD MEASUREMENTS

TIME	pH	COND	TEMP	TURB	Eh	O^2
1530	6.88	550	10°C			

TYPES OF SAMPLES COLLECTED
(1 Metals, 2 (VOC's) 1- PHC, 1 TCL, BNA, Pest, PCB's } PHC, TCL - complete

LABORATORY NAME AND LOCATION

Envirosystems Inc
Columbia Md

ROUX Consulting Ground-Water Geologists
ROUX ASSOCIATES INC

WELL SAMPLING DATA FORM

CLIENT: AMTRAK
PROJECT NO.: 055094
LOCATION: Sunnyside Yd. Queens

WELL NUMBER: MW-3
DATE: 2/21/91
WEATHER: Clear - 40°C
SAMPLED BY: H. GREGORY

TYPE OF WELL: Monitoring
STORAGE TANK:
TIME OF START: 07:55
TIME OF FINISH: 08:15

DEPTH TO BOTTOM OF WELL	14.27	FT.
DEPTH TO WATER	4.84	FT.
WATER COLUMN	9.43 x .165	FT.
VOLUME OF WATER IN WELL	1.56 E3	GAL.
VOLUME OF WATER TO REMOVE	4.68	GAL.
VOLUME REMOVED	5.0	GAL.

RATE OF PURGE:
METHOD OF PURGE: Bail

PHYSICAL APPEARANCE/COMMENTS
fairly clear

FIELD MEASUREMENTS

TIME	pH	COND	TEMP	TURB	Eh	O^2
08:10	6.93	430	8°C			

TYPES OF SAMPLES COLLECTED
PHC
PCB

LABORATORY NAME AND LOCATION
ENVIROSYSTEMS INC.
COLUMBIA, Md.

ROUX Consulting Ground-Water Geologists
ROUX ASSOCIATES INC

WELL SAMPLING DATA FORM

CLIENT Amtrak
PROJECT NO. 055094
LOCATION Sunnyside Yd. Queens

WELL NUMBER MW-5
DATE 1/7/91
WEATHER Overcast - Cold
SAMPLED BY H & P.B.

TYPE OF WELL Monitoring - 2"
STORAGE TANK
TIME OF START 12:30
TIME OF FINISH 12:50

DEPTH TO BOTTOM OF WELL _____ FT.
DEPTH TO WATER _____ FT.
WATER COLUMN _____ FT.
VOLUME OF WATER IN WELL _____ GAL.
VOLUME OF WATER TO REMOVE _____ GAL.
VOLUME REMOVED _____ GAL.

RATE OF PURGE _____
METHOD OF PURGE _____

PHYSICAL APPEARANCE/COMMENTS

Over 2' of product - no purging and only oil sample per J.Q. 01 DEC

FIELD MEASUREMENTS

TIME	pH	COND	TEMP	TURB	Eh	O^2

TYPES OF SAMPLES COLLECTED

PCB/Spec. Gravity/ Kinomatic Viscosity

LABORATORY NAME AND LOCATION

Envirosystems Inc.
Columbia, Md.

ROUX Consulting Ground-Water Geologists
ROUX ASSOCIATES INC

WELL SAMPLING DATA FORM

CLIENT Amtrak
PROJECT NO. 0553.09.4
LOCATION Sunnyside Pt.

WELL NUMBER MW-7
DATE 11/7/91
WEATHER Overcast - Cold
SAMPLED BY A.G., P.B.

TYPE OF WELL Monitoring - 2"
STORAGE TANK
TIME OF START 12:00
TIME OF FINISH 12:20

DEPTH TO BOTTOM OF WELL	14.7	FT.
DEPTH TO WATER		FT.
WATER COLUMN		FT.
VOLUME OF WATER IN WELL		GAL.
VOLUME OF WATER TO REMOVE		GAL.
VOLUME REMOVED		GAL.

RATE OF PURGE
METHOD OF PURGE

PHYSICAL APPEARANCE/COMMENTS
Oil Sample only over 4' of product ∴ No purging of oil sample only per J. Doll DEC

FIELD MEASUREMENTS

TIME	pH	COND	TEMP	TURB	Eh	O^2

TYPES OF SAMPLES COLLECTED

PCB / Spec. Gravity / Kinematic Viscosity

LABORATORY NAME AND LOCATION

Enviro Systems Inc
Columbia, Md.

ROUX Consulting Ground-Water Geologists
ROUX ASSOCIATES INC

WELL SAMPLING DATA FORM

CLIENT Amtrak
PROJECT NO. 05309
LOCATION Amtrak – Sunnyside Yd

WELL NUMBER MW-7
DATE 1/7/91
WEATHER Cloudy, Cold ≈ 35°F
SAMPLED BY C2, V.S.

TYPE OF WELL Monitoring 2" ~~Bail~~
STORAGE TANK
TIME OF START 13:20
TIME OF FINISH 14:00

DEPTH TO BOTTOM OF WELL	13.00	FT.
DEPTH TO WATER	6.55	FT.
WATER COLUMN	6.45	FT.
VOLUME OF WATER IN WELL	1.03	GAL.
VOLUME OF WATER TO REMOVE	3.09	GAL.
VOLUME REMOVED	3.50	GAL.

RATE OF PURGE
METHOD OF PURGE Bailer

PHYSICAL APPEARANCE/COMMENTS
Initially water full of black silt of grav[illegible] w/in 5 bailer to slightly gray color.

FIELD MEASUREMENTS

TIME	pH	COND	TEMP	TURB	Eh	O^2
1350	5.56	540	10°C			

TYPES OF SAMPLES COLLECTED

PAC, TCL - complete

(TCL – pest PCB BNA / metals / VOC)

LABORATORY NAME AND LOCATION
Envirosystems Inc
Columbia Md.

ROUX Consulting Ground-Water Geologists
ROUX ASSOCIATES INC

WELL SAMPLING DATA FORM

CLIENT Amtrak
PROJECT NO. 0.55097
LOCATION Amtrack N.Y. - Sunnyside Yd.

WELL NUMBER MW-13
DATE 1/7/91
WEATHER Cloudy, Cool
SAMPLED BY C.Z., V.S.

TYPE OF WELL Monitoring - 4"
STORAGE TANK
TIME OF START 09:30
TIME OF FINISH 10:50

DEPTH TO BOTTOM OF WELL	12.00	FT.
DEPTH TO WATER	2.50	FT.
WATER COLUMN	9.5	FT.
VOLUME OF WATER IN WELL	6.175	GAL.
VOLUME OF WATER TO REMOVE	18.3	GAL.
VOLUME REMOVED	19.00	GAL.

RATE OF PURGE
METHOD OF PURGE Bailer

PHYSICAL APPEARANCE/COMMENTS
brownish/ cloudy, sheen

FIELD MEASUREMENTS

TIME	pH	COND	TEMP	TURB	Eh	O^2
1045	6.24	630 uS/cm	8°C			

TYPES OF SAMPLES COLLECTED

TCL. 1 Gallon, 1 Qt. 2 VOA's 1 Metals

PHC PCB Pest
Water BNA 4 Liter

} PHC, TCL - complete: Pest PCB BNA/metals/VOC

LABORATORY NAME AND LOCATION

Envirosystems
Columbia, Md.

ROUX Consulting Ground-Water Geologists
ROUX ASSOCIATES INC

WELL SAMPLING DATA FORM

CLIENT: AMTRAK
PROJECT NO.: 055094
LOCATION: Sunnyside Yd. Queens

WELL NUMBER: MW-16
DATE: 1/7/91
WEATHER: Overcast - cold
SAMPLED BY: HG, P.B.

TYPE OF WELL: Monitoring - 4"
STORAGE TANK:
TIME OF START: 13:00
TIME OF FINISH: 13:15

DEPTH TO BOTTOM OF WELL		FT.
DEPTH TO WATER		FT.
WATER COLUMN		FT.
VOLUME OF WATER IN WELL		GAL.
VOLUME OF WATER TO REMOVE		GAL.
VOLUME REMOVED		GAL.

RATE OF PURGE:
METHOD OF PURGE:

PHYSICAL APPEARANCE/COMMENTS
over 3' of product - sample only oil - no purge per J.Q of DEC

FIELD MEASUREMENTS

TIME	pH	COND	TEMP	TURB	Eh	O^2

TYPES OF SAMPLES COLLECTED

PCB / Spec. Grav. / Kinomatic viscosity

LABORATORY NAME AND LOCATION

ENVIROSYSTEMS INC.
COLUMBIA, Md.

ROUX Consulting Ground-Water Geologists
ROUX ASSOCIATES INC

WELL SAMPLING DATA FORM

CLIENT Amtrak
PROJECT NO. 055094
LOCATION Sunnyside Yd. Queens

WELL NUMBER MW-17
DATE 1/8/91
WEATHER Overcast - cold
SAMPLED BY BG., P.B.

TYPE OF WELL Monitoring - 4"
STORAGE TANK
TIME OF START 13:20
TIME OF FINISH 13:35

DEPTH TO BOTTOM OF WELL _____ FT.
DEPTH TO WATER _____ FT.
WATER COLUMN _____ FT.
VOLUME OF WATER IN WELL _____ GAL.
VOLUME OF WATER TO REMOVE _____ GAL.
VOLUME REMOVED _____ GAL.

RATE OF PURGE _____
METHOD OF PURGE _____

PHYSICAL APPEARANCE/COMMENTS
over 2' of product — Sample product only - do not purge per T.O. of DEC.

FIELD MEASUREMENTS

TIME	pH	COND	TEMP	TURB	Eh	O^2

TYPES OF SAMPLES COLLECTED

PCB / Spec. Grav / kinematic viscosity

LABORATORY NAME AND LOCATION

Envirosystems Inc.
Columbia, Md.

ROUX Consulting Ground-Water Geologists
ROUX ASSOCIATES INC

WELL SAMPLING DATA FORM

CLIENT Amrad
PROJECT NO. 05504
LOCATION Sunnyside Rd.

WELL NUMBER MW-19
DATE 1/4/94
WEATHER clear - cold
SAMPLED BY H.G., V.S., C.Z.

TYPE OF WELL Monitoring - 4"
STORAGE TANK
TIME OF START 09:05
TIME OF FINISH 09:30

DEPTH TO BOTTOM OF WELL	16.3	FT.
DEPTH TO WATER	7.2	FT.
WATER COLUMN	9.1	FT.
VOLUME OF WATER IN WELL	6	GAL.
VOLUME OF WATER TO REMOVE	18	GAL.
VOLUME REMOVED	DRY AFTER BAILING 8	GAL.

RATE OF PURGE
METHOD OF PURGE Bailing

PHYSICAL APPEARANCE/COMMENTS
Slightly cloudy - rust colored particles floating on surface of water floating in samples

FIELD MEASUREMENTS

TIME	pH	COND	TEMP	TURB	Eh	O_2
09:10	6.49	686	11°C			

TYPES OF SAMPLES COLLECTED
PAC, TCL: pest./PCB/BNA/metals/VOC (complete)

LABORATORY NAME AND LOCATION
Enviro systems
Columbia, Md

ROUX Consulting Ground-Water Geologists ROUX ASSOCIATES INC

WELL SAMPLING DATA FORM

CLIENT Amtrak
PROJECT NO. 053094
LOCATION Sunnyside Yd. Queens

WELL NUMBER MW-20
DATE 1/7/91
WEATHER overcast - Cold
SAMPLED BY H.G, P.B.

TYPE OF WELL Monitoring - 4"
STORAGE TANK
TIME OF START 10:30
TIME OF FINISH 1050

DEPTH TO BOTTOM OF WELL	13.4	FT.
DEPTH TO WATER		FT.
WATER COLUMN		FT.
VOLUME OF WATER IN WELL		GAL.
VOLUME OF WATER TO REMOVE		GAL.
VOLUME REMOVED		GAL.

RATE OF PURGE
METHOD OF PURGE

PHYSICAL APPEARANCE/COMMENTS

≈ 6" of product - sample product only - don't purge per T.O of PEC.

FIELD MEASUREMENTS

TIME	pH	COND	TEMP	TURB	Eh	O^2

TYPES OF SAMPLES COLLECTED

PCB / Spec. Gravity / Kinematic Viscosity

LABORATORY NAME AND LOCATION

Enviro Systems Inc.
Columbia, Md.

ROUX Consulting Ground-Water Geologists
ROUX ASSOCIATES INC

WELL SAMPLING DATA FORM

CLIENT Amtrak
PROJECT NO. 055094
LOCATION Sunnyside Rd.

WELL NUMBER MW-21
DATE 11/4/91
WEATHER Clear - cold
SAMPLED BY AG, V.S, CZ

TYPE OF WELL Monitoring
STORAGE TANK
TIME OF START 09:40
TIME OF FINISH 09:55
Returned 11:25 – 11:40 for readings/MSD

DEPTH TO BOTTOM OF WELL	11.1	FT.
DEPTH TO WATER	3.15	FT.
WATER COLUMN	7.95	FT.
VOLUME OF WATER IN WELL	5.2	GAL.
VOLUME OF WATER TO REMOVE	15.6	GAL.
VOLUME REMOVED	Dry After Bailing 7	GAL.

RATE OF PURGE
METHOD OF PURGE BAILER

PHYSICAL APPEARANCE/COMMENTS

Slightly cloudy. Surface had a small amount of rust color particles, also alot of heavy Dark particles were picked up in the bailer. They settled quickly. Samples became progressively more turbid

FIELD MEASUREMENTS

TIME	pH	COND	TEMP	TURB	Eh	O^2
09:45	6.52	728	11°C			

TYPES OF SAMPLES COLLECTED

PHC / PCB
PHC / PCB *REP #1
MS/MSD – (PHC, PCB) → 4 Bottles tot.

LABORATORY NAME AND LOCATION

Envirosystems Inc
Columbia, Md.

ROUX Consulting Ground-Water Geologists
ROUX ASSOCIATES INC

WELL SAMPLING DATA FORM

CLIENT Amtrak
PROJECT NO. 0550AY
LOCATION Amtrak - Glenn Yard #4

WELL NUMBER MW-22
DATE 1/7/98
WEATHER Cloudy - Cold ~35°F
SAMPLED BY CT, VS

TYPE OF WELL Monitoring - 4' ~~4" PVC 0.5 Screen~~
STORAGE TANK
TIME OF START 11:00
TIME OF FINISH 12:40

DEPTH TO BOTTOM OF WELL	10.40	FT.
DEPTH TO WATER	1.75	FT.
WATER COLUMN	8.65	FT.
VOLUME OF WATER IN WELL	5.62	GAL.
VOLUME OF WATER TO REMOVE	16.26	GAL.
VOLUME REMOVED	12.00	GAL.

RATE OF PURGE
METHOD OF PURGE Bailer

PHYSICAL APPEARANCE/COMMENTS
Product layer on top ~ 1/2" colum, (water clear) purged & sampled water (RP) Product emulsified throughout sample not possible to sample product only -

FIELD MEASUREMENTS

TIME	pH	COND	TEMP	TURB	Eh	O^2
1235	5.61	450	10°C			

TYPES OF SAMPLES COLLECTED
PCB / PAC -

LABORATORY NAME AND LOCATION
Enviro systems Inc
Columbia. Md

ROUX Consulting Ground-Water Geologists
ROUX ASSOCIATES INC

WELL SAMPLING DATA FORM

CLIENT: AMTRAK
PROJECT NO.: 055099
LOCATION: Sunnyside Yd, Queens.

WELL NUMBER: MW-23
DATE: 11/7/91
WEATHER:
SAMPLED BY: H.G., P.B., V.S., C.Z.

TYPE OF WELL: Monitoring - 4"
STORAGE TANK:
TIME OF START: 16:30
TIME OF FINISH: 17:10

DEPTH TO BOTTOM OF WELL	37	FT.
DEPTH TO WATER	5	FT.
WATER COLUMN	32	FT.
VOLUME OF WATER IN WELL	20.8	GAL.
VOLUME OF WATER TO REMOVE	62.4	GAL.
VOLUME REMOVED	70 Gal	GAL.

RATE OF PURGE: 10 GPM
METHOD OF PURGE: Sub. Pump.

PHYSICAL APPEARANCE/COMMENTS

FIELD MEASUREMENTS

TIME	pH	COND	TEMP	TURB	Eh	O^2
17:00	7.03	950	10°C			

TYPES OF SAMPLES COLLECTED

PHC, TCL: Pest. BNA PCB, TCL: metals, TCL: VOC } PHC/TCL - complete
Rep-4 → PHC/PCB

* Rep-4 (PHC, PCB)

LABORATORY NAME AND LOCATION

Envirosystems Inc
Columbia, Md.

ROUX Consulting Ground-Water Geologists
ROUX ASSOCIATES INC

WELL SAMPLING DATA FORM

CLIENT AMTRAK
PROJECT NO. 055091
LOCATION SUNNYSIDE YARD

WELL NUMBER MW-24
DATE 1/3/91
WEATHER CLEAR, HIGH 30'S
SAMPLED BY JD, VS

TYPE OF WELL MONITORING - 4"
STORAGE TANK
TIME OF START 1200
TIME OF FINISH 1230

DEPTH TO BOTTOM OF WELL	25.8	FT.
DEPTH TO WATER	17.9	FT.
WATER COLUMN	7.9	FT.
VOLUME OF WATER IN WELL	5.14	GAL.
VOLUME OF WATER TO REMOVE	15.5	GAL.
VOLUME REMOVED	16.0	GAL.

RATE OF PURGE
METHOD OF PURGE 3.25" PVC BAILER

PHYSICAL APPEARANCE/COMMENTS
BROWN, TURBID

FIELD MEASUREMENTS

TIME	pH	COND	TEMP	TURB	Eh	O^2
1215	6.36	290	12°C	—	—	—

TYPES OF SAMPLES COLLECTED
TPH, PCB ⟶ (PHC/PCB)

LABORATORY NAME AND LOCATION
Enviro Systems Inc
Columbia, Md.

ROUX Consulting Ground-Water Geologists
ROUX ASSOCIATES INC

WELL SAMPLING DATA FORM

CLIENT: AMTRAK
PROJECT NO.: 055094
LOCATION: Sunnyside Yd

WELL NUMBER: MW-25
DATE: 1/4/91
WEATHER: Clear - Cold
SAMPLED BY: H.G., D.S., T.Z.

TYPE OF WELL: Monitoring - 4"
STORAGE TANK:
TIME OF START: 12:20
TIME OF FINISH: 13:10

DEPTH TO BOTTOM OF WELL	14.6	FT.
DEPTH TO WATER	5.9	FT.
WATER COLUMN	8.7	FT.
VOLUME OF WATER IN WELL	5.65	GAL.
VOLUME OF WATER TO REMOVE	17.15	GAL.
VOLUME REMOVED	18	GAL.

RATE OF PURGE:
METHOD OF PURGE: Bailing

PHYSICAL APPEARANCE/COMMENTS
Water very turbid - muddy.

FIELD MEASUREMENTS

TIME	pH	COND	TEMP	TURB	Eh	O^2
1305	6.60	184	10°C			

TYPES OF SAMPLES COLLECTED
TCL: pest./PCB/BNA, METALS, VOC } PHC/TCL - complete
PHC

LABORATORY NAME AND LOCATION
Envirosystems Inc.
Columbia, Md.

ROUX Consulting Ground-Water Geologists
ROUX ASSOCIATES INC

WELL SAMPLING DATA FORM

CLIENT AMTRAK
PROJECT NO. 055094
LOCATION SUNNYSIDE YARD

WELL NUMBER MW-26
DATE 1-3-9[illegible]
WEATHER CLEAR, MID 30's
SAMPLED BY JD, VS

TYPE OF WELL MONITORING - 4"
STORAGE TANK ~~1015~~
TIME OF START 1015
TIME OF FINISH 1100

DEPTH TO BOTTOM OF WELL	18.7	FT.
DEPTH TO WATER	13.3	FT.
WATER COLUMN	5.4	FT.
VOLUME OF WATER IN WELL	3.51	GAL.
VOLUME OF WATER TO REMOVE	10.5	GAL.
VOLUME REMOVED	11.5	GAL.

RATE OF PURGE
METHOD OF PURGE 3.25" PVC BAILER

PHYSICAL APPEARANCE/COMMENTS
BROWN, TURBID

FIELD MEASUREMENTS

TIME	pH	COND	TEMP	TURB	Eh	O^2
1035	6.65	650	10°C			

TYPES OF SAMPLES COLLECTED
PHC, TCL: VOC, PEST/PCB, BNA, METALS (complete)

LABORATORY NAME AND LOCATION
ENVIROSYSTEMS, ~~INC~~ INC
Columbia, Md

ROUX Consulting Ground-Water Geologists
ROUX ASSOCIATES INC

WELL SAMPLING DATA FORM

CLIENT Amtrak
PROJECT NO. 05309
LOCATION Sunnyside Yd.

WELL NUMBER MW-27
DATE 11/4/90
WEATHER Clear - Cold
SAMPLED BY HG, V.S. CZ

TYPE OF WELL Monitoring - 4"
STORAGE TANK
TIME OF START 15:30
TIME OF FINISH 1605

DEPTH TO BOTTOM OF WELL	18.0	FT.
DEPTH TO WATER	10.9	FT.
WATER COLUMN	7.1	FT.
VOLUME OF WATER IN WELL	4.6	GAL.
VOLUME OF WATER TO REMOVE	13.8	GAL.
VOLUME REMOVED	15	GAL.

RATE OF PURGE
METHOD OF PURGE BAILING

PHYSICAL APPEARANCE/COMMENTS
Very clear

FIELD MEASUREMENTS

TIME	pH	COND	TEMP	TURB	Eh	O^2
16:00	6.45	750	10°C			

TYPES OF SAMPLES COLLECTED

PHC / PCB
* REP-2 - PHC / PCB
MS/MSD - PHC/PCB

LABORATORY NAME AND LOCATION

Environsystems Inc.
Columbia, Md.

ROUX Consulting Ground-Water Geologists
ROUX ASSOCIATES INC

WELL SAMPLING DATA FORM

CLIENT: Amtrak
PROJECT NO.: 055094
LOCATION: Sunnyside Yd.

WELL NUMBER: MW-38
DATE: 1/3/94
WEATHER: Clear — COLD
SAMPLED BY: H.G., C.Z.

TYPE OF WELL: Monitoring - 4"
STORAGE TANK:
TIME OF START: 16:20
TIME OF FINISH: 16:40

DEPTH TO BOTTOM OF WELL	15.3	FT.
DEPTH TO WATER	7.6	FT.
WATER COLUMN	7.7	FT.
VOLUME OF WATER IN WELL	≈ 5	GAL.
VOLUME OF WATER TO REMOVE	15	GAL.
VOLUME REMOVED	Day after bailing 10	GAL.

RATE OF PURGE:
METHOD OF PURGE: BAILING

PHYSICAL APPEARANCE/COMMENTS
Clear to slightly cloudy

FIELD MEASUREMENTS

TIME	pH	COND	TEMP	TURB	Eh	O^2
16:30	6.94	1200	8°C			

TYPES OF SAMPLES COLLECTED
TCL: Pest/PCB/BNA, Total Metals, VOC } PHC/TCL - complete
TPH (PHC)

LABORATORY NAME AND LOCATION
Enviro Systems, Inc
Columbia, Md.

ROUX Consulting Ground-Water Geologists
ROUX ASSOCIATES INC

WELL SAMPLING DATA FORM

CLIENT: AMTRAK
PROJECT NO.: 055099
LOCATION: Sunnyside Yd.

WELL NUMBER: MW-29
DATE: 1/3/90
WEATHER: Clear - COLD
SAMPLED BY: H.G., C.Z.

TYPE OF WELL: Monitoring - 4"
STORAGE TANK:
TIME OF START: 15:25
TIME OF FINISH: 15:45

DEPTH TO BOTTOM OF WELL	13.5	FT.
DEPTH TO WATER	4.0	FT.
WATER COLUMN	9.5	FT.
VOLUME OF WATER IN WELL	6.2	GAL.
VOLUME OF WATER TO REMOVE	18.6	GAL.
VOLUME REMOVED	20	GAL.

RATE OF PURGE:
METHOD OF PURGE: BAILING

PHYSICAL APPEARANCE/COMMENTS
Rust colored particles floating in & on water column.

FIELD MEASUREMENTS

TIME	pH	COND	TEMP	TURB	Eh	O_2
15:30	6.52	1900	10°C			

TYPES OF SAMPLES COLLECTED
TCL: Pest./PCBs/BNA, Total Metals, VOC } PHC/TCL-complete
PHC (TPH)

LABORATORY NAME AND LOCATION
Envirosystems Inc.
Columbia, Md.

ROUX Consulting Ground-Water Geologists
ROUX ASSOCIATES INC

WELL SAMPLING DATA FORM

CLIENT: AMTRAK
PROJECT NO.: 05509.4
LOCATION: Sinnissippi Yd.

WELL NUMBER: MW-30
DATE: 1/3/91
WEATHER: CLEAR - COLD
SAMPLED BY: M. GREGORY, C. ZEC.

TYPE OF WELL: MONITORING ~4"
STORAGE TANK:
TIME OF START: 11:25
TIME OF FINISH: 11:40

DEPTH TO BOTTOM OF WELL	17.05	FT.
DEPTH TO WATER	7.5	FT.
WATER COLUMN	9.5	FT.
VOLUME OF WATER IN WELL	≈ 6.2	GAL.
VOLUME OF WATER TO REMOVE	18.6	GAL.
VOLUME REMOVED	20	GAL.

RATE OF PURGE:
METHOD OF PURGE: BAILING

PHYSICAL APPEARANCE/COMMENTS

WATER CLEAR

FIELD MEASUREMENTS

TIME	pH	COND	TEMP	TURB	Eh	O^2
11:30	6.56	800	8°C			

TYPES OF SAMPLES COLLECTED

PCB, PHC

LABORATORY NAME AND LOCATION

ENVIROSYSTEMS, INC
Columbia, MD

ROUX Consulting Ground-Water Geologists
ROUX ASSOCIATES INC

WELL SAMPLING DATA FORM

CLIENT Amtrak
PROJECT NO. 3550q4
LOCATION Sunnyside Yd.

WELL NUMBER MW-31
DATE 1/4/90
WEATHER Clear - Cold
SAMPLED BY HG, VS, CZ.

TYPE OF WELL Monitoring - 4"
STORAGE TANK
TIME OF START 10:35
TIME OF FINISH 11:10

DEPTH TO BOTTOM OF WELL	12.5	FT.
DEPTH TO WATER	4.0'	FT.
WATER COLUMN	8.5	FT.
VOLUME OF WATER IN WELL	5.5	GAL.
VOLUME OF WATER TO REMOVE	16.5	GAL.
VOLUME REMOVED	17.0	GAL.

RATE OF PURGE
METHOD OF PURGE Bailing

PHYSICAL APPEARANCE/COMMENTS
Water very turbid — V.S. noticed slight sheen (oily) in bailer after purging about 10 Gal. — Did normal sampling (one/2B but cancelled Rep & MS/MSD

FIELD MEASUREMENTS

TIME	pH	COND	TEMP	TURB	Eh	O^2
11:05	6.24	630	8°C			

TYPES OF SAMPLES COLLECTED

PHC/PCB
REPLICATE #1 PHC/PCB
~~MS/MSD — PHC/PCB~~ Void due to sheen — Sampled only PHC/PCB

LABORATORY NAME AND LOCATION

Enviro Systems Inc.
Columbia, Md.

ROUX Consulting Ground-Water Geologists
ROUX ASSOCIATES INC

WELL SAMPLING DATA FORM

CLIENT Amtrak
PROJECT NO. 05509J
LOCATION Sunnyside Yd.

WELL NUMBER MW-32
DATE 1/3/91
WEATHER Clear - Cold
SAMPLED BY LG CZ

TYPE OF WELL Monitoring - 4"
STORAGE TANK
TIME OF START 12:25
TIME OF FINISH 12:45

DEPTH TO BOTTOM OF WELL	11.9	FT.
DEPTH TO WATER	3.9	FT.
WATER COLUMN	8.0	FT.
VOLUME OF WATER IN WELL	5.2	GAL.
VOLUME OF WATER TO REMOVE	15.6	GAL.
VOLUME REMOVED	Dry after bailing 11 GAL	GAL.

RATE OF PURGE
METHOD OF PURGE Bailing

PHYSICAL APPEARANCE/COMMENTS

FIELD MEASUREMENTS

TIME	pH	COND	TEMP	TURB	Eh	O^2
12:30	7.15	900	10°C			

TYPES OF SAMPLES COLLECTED

TPH, TCL: BSS/PCB/BNA, Total METALS, VOC } PHC/TCL - complete

LABORATORY NAME AND LOCATION

Environsystems Inc
Columbia, Md

ROUX Consulting Ground-Water Geologists
ROUX ASSOCIATES INC

WELL SAMPLING DATA FORM

CLIENT Amtrak
PROJECT NO. 01594
LOCATION Sunnyside Yd

WELL NUMBER MW-33
DATE 11/4/91
WEATHER Clear - Cold
SAMPLED BY HK, V.S. CL

TYPE OF WELL Monitoring - 4"
STORAGE TANK
TIME OF START 17:10
TIME OF FINISH 17:45

DEPTH TO BOTTOM OF WELL	~~10.0~~ 17.3	FT.
DEPTH TO WATER	~~5~~ 9.8	FT.
WATER COLUMN	7.5	FT.
VOLUME OF WATER IN WELL	4.9	GAL.
VOLUME OF WATER TO REMOVE	14.7	GAL.
VOLUME REMOVED	17	GAL.

RATE OF PURGE
METHOD OF PURGE Bailer

PHYSICAL APPEARANCE/COMMENTS
Fairly Clear

FIELD MEASUREMENTS

TIME	pH	COND	TEMP	TURB	Eh	O_2
17:40	6.13	694	10°C			

TYPES OF SAMPLES COLLECTED

PHC
TCL : Pest./PCB/BNA/metals/VOC
Rep 3 TCL
MS/MSD PHC/TCL - all

} PHC/TCL - complete
} *REP-3 - TCL - complete
MS/MSD - PHC/TCL - complete

LABORATORY NAME AND LOCATION

ROUX Consulting Ground-Water Geologists
ROUX ASSOCIATES INC

WELL SAMPLING DATA FORM

CLIENT: AMTRAK
PROJECT NO.: 055094
LOCATION: Sunnyside Yd.

WELL NUMBER: MW-34
DATE: 11/3/91
WEATHER: CLEAR - COLD
SAMPLED BY: H. GREGORY, C. ZEC

TYPE OF WELL: MONITORING - 4"
STORAGE TANK:
TIME OF START: 10:35
TIME OF FINISH: 11:00

DEPTH TO BOTTOM OF WELL	19.7	FT.
DEPTH TO WATER	14.8	FT.
WATER COLUMN	4.9	FT.
VOLUME OF WATER IN WELL	3.2	GAL.
VOLUME OF WATER TO REMOVE	9.6	GAL.
VOLUME REMOVED	10	GAL.

RATE OF PURGE:
METHOD OF PURGE: P.V.C BAILER

PHYSICAL APPEARANCE/COMMENTS

SLIGHTLY CLOUDY ≈ 50 NTU

FIELD MEASUREMENTS

TIME	pH	COND	TEMP	TURB	Eh	O^2
10:45	6.92	2300	10°C			

TYPES OF SAMPLES COLLECTED 10:55

PHC / PCB

LABORATORY NAME AND LOCATION

ENVIROSYSTEMS INC
Columbia, Md.

APPENDIX H

Slug Test Data

<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<>>

A Q T E S O L V   R E S U L T S

03/19/91 11:06:20

PROBLEM DEFINITION

Problem title: BOUWER-RICE SLUG TEST ANAL MW19 (test1)

Knowns and Constants:

No. of data points.................. 33
Radius of well casing............... 0.268
Radius of well...................... 0.417
Aquifer saturated thickness......... 64.49
Well screen length.................. 10
Static height of water in well...... 9.62
Log(Re/Rw).......................... 1.928
A, B, C............................. 2.262, 0.363, 0.000

ANALYTICAL METHOD

Bouwer and Rice (unconfined aquifer slug test)

RESULTS FROM STATISTICAL CURVE MATCHING

STATISTICAL MATCH PARAMETER ESTIMATES

	Estimate		Std. Error
K =	5.5951E-004	+/-	3.7733E-005
y0 =	1.5295E+000	+/-	4.0858E-003

ANALYSIS OF MODEL RESIDUALS

residual = calculated - observed
weighted residual = residual * weight

Weighted Residual Statistics:

Number of residuals................ 20
Number of estimated parameters.... 2
Degrees of freedom................ 18
Residual mean..................... 1.569E-006
Residual standard deviation....... 0.009266
Residual variance................. 8.586E-005

Model Residuals:

Time	Observed	Calculated	Residual	Weight

0.15	1.531	1.5111	0.019879	1
0.1666	1.521	1.5091	0.011904	1
0.1833	1.515	1.5071	0.0079395	1
0.2	1.512	1.505	0.0069718	1
0.2166	1.505	1.503	0.0019892	1
0.2333	1.502	1.501	0.0010161	1
0.25	1.496	1.499	-0.0029598	1
0.2666	1.493	1.497	-0.0039505	1
0.2833	1.489	1.4949	-0.0059318	1
0.3	1.486	1.4929	-0.0069159	1
0.3166	1.483	1.4909	-0.0079147	1
0.3333	1.48	1.4889	-0.0089041	1
0.4166	1.47	1.4789	-0.008916	1
0.5	1.458	1.469	-0.010983	1
0.5833	1.451	1.4591	-0.0081284	1
0.6666	1.442	1.4493	-0.0073399	1
0.75	1.436	1.4396	-0.0036055	1
0.8333	1.432	1.4299	0.0020519	1
0.9166	1.429	1.4204	0.0086446	1
1	1.426	1.4108	0.015184	1

==========

RESULTS FROM VISUAL CURVE MATCHING

VISUAL MATCH PARAMETER ESTIMATES

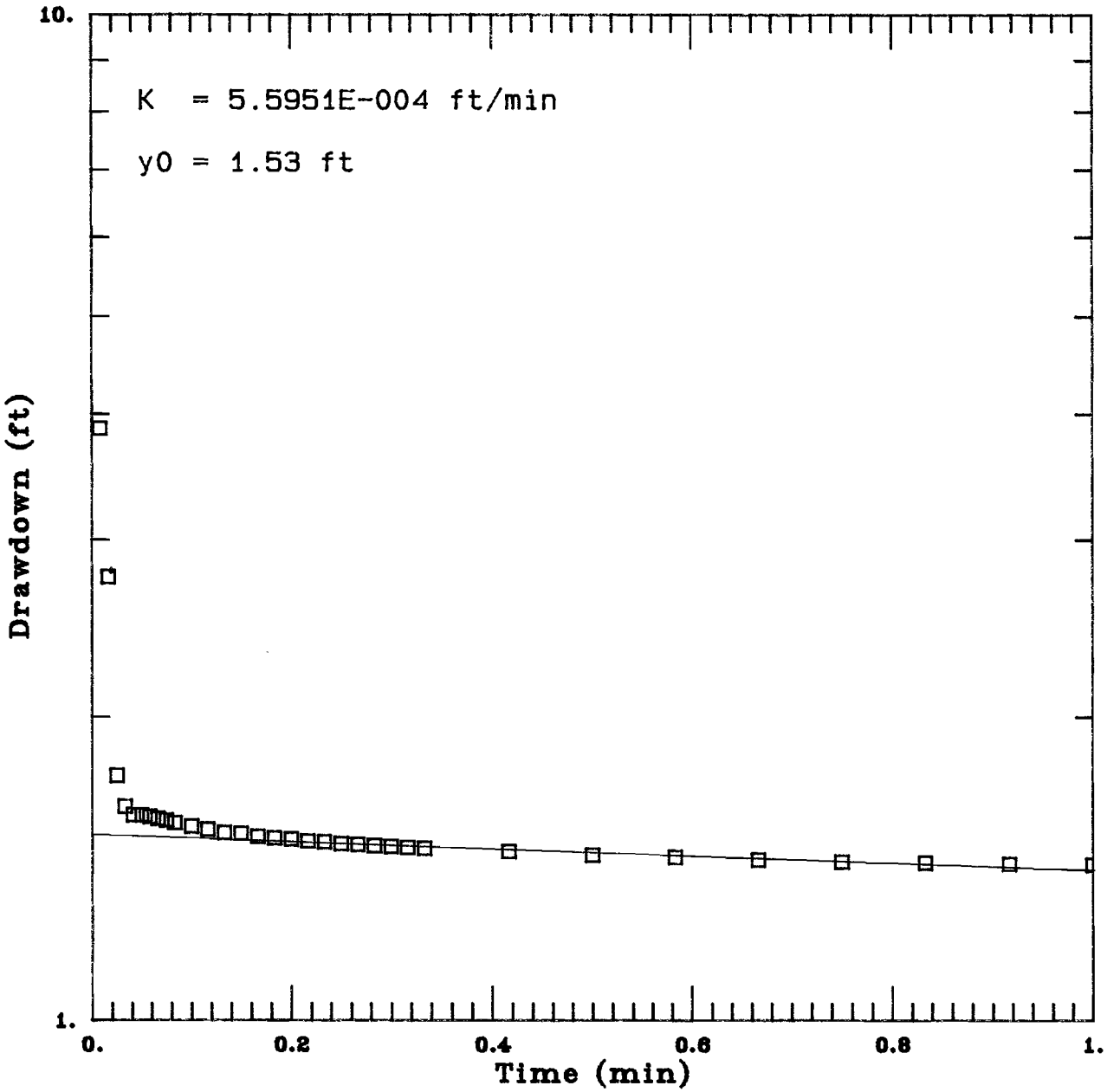
	Estimate
K =	5.5951E-004
y0 =	1.5295E+000

BOUWER-RICE SLUG TEST ANAL MW19 (test1)

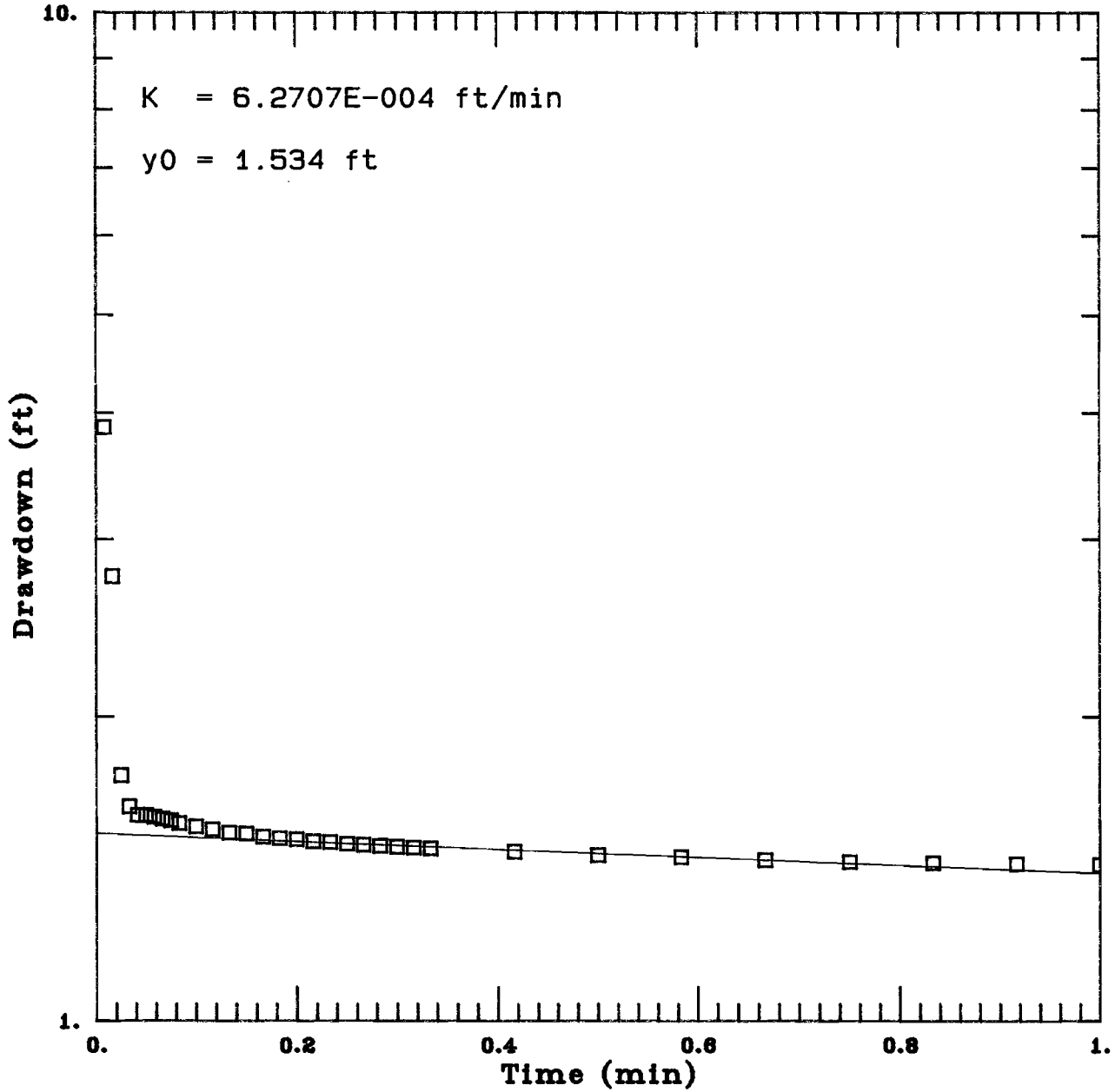
slugt1
3.865
0.268
0.417
slugt2
64.49
10
9.62
tsdata

0.0083	3.865	0
0.0166	2.752	0
0.025	1.749	0
0.0333	1.629	0
0.0416	1.597	0
0.05	1.597	0
0.0583	1.591	0
0.0666	1.584	0
0.075	1.578	0
0.0833	1.568	0
0.1	1.556	0
0.1166	1.546	0
0.1333	1.534	0
0.15	1.531	1
0.1666	1.521	1
0.1833	1.515	1
0.2	1.512	1
0.2166	1.505	1
0.2333	1.502	1
0.25	1.496	1
0.2666	1.493	1
0.2833	1.489	1
0.3	1.486	1
0.3166	1.483	1
0.3333	1.48	1
0.4166	1.47	1
0.5	1.458	1
0.5833	1.451	1
0.6666	1.442	1
0.75	1.436	1
0.8333	1.432	1
0.9166	1.429	1
1	1.426	1

BOUWER-RICE SLUG TEST ANAL MW19 (test1)



BOUWER-RICE SLUG TEST ANAL MW19 (test1)



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PROBLEM DEFINITION

Problem title: BOUWER-RICE SLUG TEST ANAL MW19 (test2)

Knowns and Constants:
- No. of data points.................. 33
- Radius of well casing............... 0.268
- Radius of well...................... 0.417
- Aquifer saturated thickness......... 64.49
- Well screen length.................. 10
- Static height of water in well...... 9.62
- Log(Re/Rw).......................... 1.928
- A, B, C............................. 2.262, 0.363, 0.000

==

ANALYTICAL METHOD

Bouwer and Rice (unconfined aquifer slug test)

==

RESULTS FROM STATISTICAL CURVE MATCHING

STATISTICAL MATCH PARAMETER ESTIMATES

	Estimate		Std. Error
K =	2.3274E-004	+/-	1.8289E-005
y0 =	2.4734E+000	+/-	2.6600E-003

ANALYSIS OF MODEL RESIDUALS

residual = calculated - observed
weighted residual = residual * weight

Weighted Residual Statistics:
- Number of residuals............... 30
- Number of estimated parameters.... 2
- Degrees of freedom................ 28
- Residual mean..................... 3.874E-007
- Residual standard deviation....... 0.009518
- Residual variance.................. 9.059E-005

Model Residuals:

Time	Observed	Calculated	Residual	Weight
0.0333	2.492	2.4706	0.021398	1

0.0416	2.492	2.4699	0.022087	1
0.05	2.483	2.4692	0.013784	1
0.0583	2.476	2.4685	0.0074732	1
0.0666	2.473	2.4678	0.0051618	1
0.075	2.473	2.4671	0.0058585	1
0.0833	2.47	2.4665	0.0035467	1
0.1	2.467	2.4651	0.0019308	1
0.1166	2.464	2.4637	0.00030584	1
0.1333	2.461	2.4623	-0.0013116	1
0.15	2.457	2.4609	-0.0039298	1
0.1666	2.454	2.4596	-0.0055571	1
0.1833	2.451	2.4582	-0.0071768	1
0.2	2.451	2.4568	-0.0057974	1
0.2166	2.448	2.4554	-0.0074269	1
0.2333	2.445	2.454	-0.009049	1
0.25	2.445	2.4527	-0.0076719	1
0.2666	2.442	2.4513	-0.0093037	1
0.2833	2.442	2.4499	-0.0079281	1
0.3	2.438	2.4486	-0.010553	1
0.3166	2.438	2.4472	-0.0091874	1
0.3333	2.438	2.4458	-0.0078141	1
0.4166	2.432	2.439	-0.0069756	1
0.5	2.426	2.4321	-0.006148	1
0.5833	2.419	2.4253	-0.0063476	1
0.6666	2.416	2.4186	-0.0025663	1
0.75	2.413	2.4118	0.0012042	1
0.8333	2.41	2.4051	0.0049476	1
0.9166	2.41	2.3983	0.011672	1
1	2.407	2.3916	0.015386	1

==========

RESULTS FROM VISUAL CURVE MATCHING

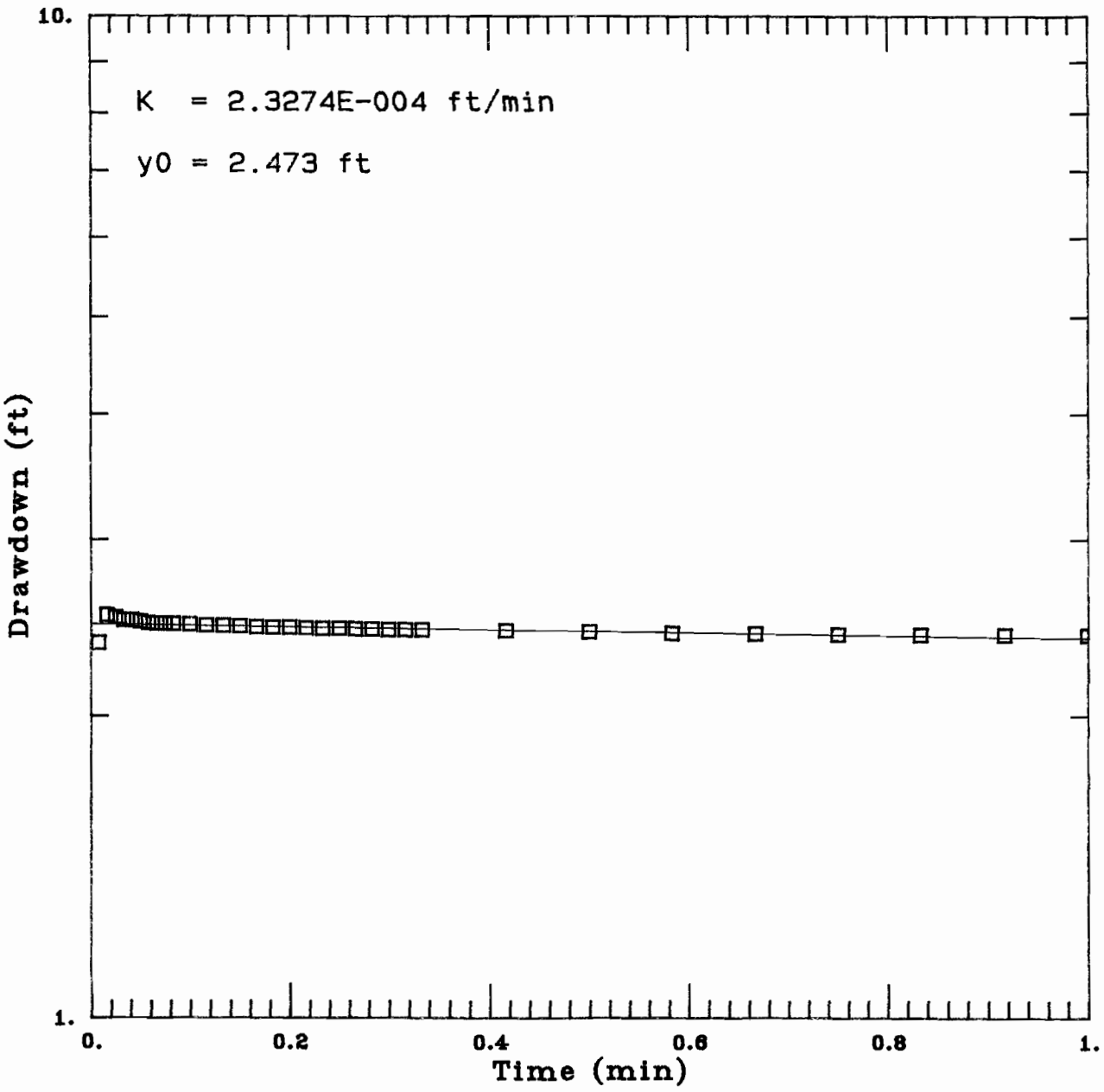
VISUAL MATCH PARAMETER ESTIMATES

	Estimate
K =	2.3274E-004
y0 =	2.4734E+000

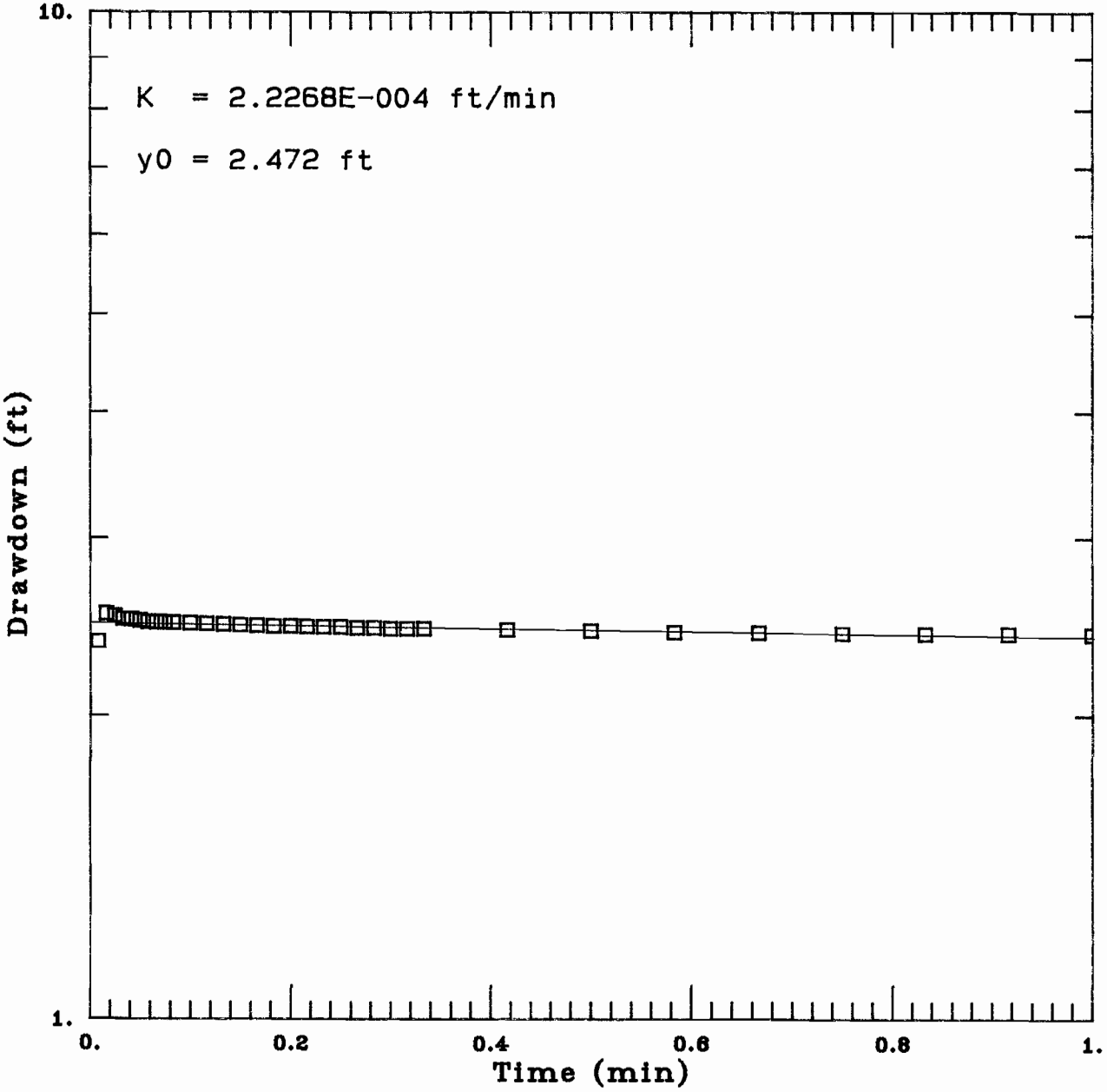
BOUWER-RICE SLUG TEST ANAL MW19 (test2)

```
slugt1
2.859
0.268
0.417
slugt2
64.49
10
9.62
tsdata
0.0083    2.366    0
0.0166    2.521    0
0.025    2.508    0
0.0333    2.492    1
0.0416    2.492    1
0.05    2.483    1
0.0583    2.476    1
0.0666    2.473    1
0.075    2.473    1
0.0833    2.47    1
0.1    2.467    1
0.1166    2.464    1
0.1333    2.461    1
0.15    2.457    1
0.1666    2.454    1
0.1833    2.451    1
0.2    2.451    1
0.2166    2.448    1
0.2333    2.445    1
0.25    2.445    1
0.2666    2.442    1
0.2833    2.442    1
0.3    2.438    1
0.3166    2.438    1
0.3333    2.438    1
0.4166    2.432    1
0.5    2.426    1
0.5833    2.419    1
0.6666    2.416    1
0.75    2.413    1
0.8333    2.41    1
0.9166    2.41    1
1    2.407    1
```

BOUWER-RICE SLUG TEST ANAL MW19 (test2)



BOUWER-RICE SLUG TEST ANAL MW19 (test2)



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03/16/91 15:22:22

PROBLEM DEFINITION

Problem title: BOUWER-RICE SLUG TEST ANAL MW23 (test 1)

Knowns and Constants:

No. of data points.................. 62
Radius of well casing............... 0.167
Radius of well...................... 0.417
Aquifer saturated thickness......... 65.75
Well screen length.................. 10
Static height of water in well...... 34.35
Log(Re/Rw).......................... 2.445
A, B, C............................. 2.262, 0.363, 0.000

ANALYTICAL METHOD

Bouwer and Rice (unconfined aquifer slug test)

RESULTS FROM STATISTICAL CURVE MATCHING

STATISTICAL MATCH PARAMETER ESTIMATES

	Estimate		Std. Error
K =	1.5137E-003	+/-	5.3676E-006
y0 =	1.9322E+000	+/-	1.7606E-003

ANALYSIS OF MODEL RESIDUALS

residual = calculated - observed
weighted residual = residual * weight

Weighted Residual Statistics:

Number of residuals............... 39
Number of estimated parameters.... 2
Degrees of freedom................ 37
Residual mean..................... 5.872E-005
Residual standard deviation....... 0.006528
Residual variance................. 4.262E-005

Model Residuals:

Time	Observed	Calculated	Residual	Weight
0.0416	1.923	1.8968	0.026199	1

0.05	1.891	1.8897	0.0012616	1
0.0583	1.888	1.8828	0.0052139	1
0.0666	1.882	1.8759	0.0061406	1
0.075	1.866	1.8689	-0.0028752	1
0.0833	1.869	1.862	0.0070003	1
0.1	1.85	1.8482	0.0017576	1
0.1166	1.834	1.8347	-0.00066826	1
0.1333	1.818	1.8211	-0.0031129	1
0.15	1.806	1.8077	-0.0016577	1
0.1666	1.79	1.7944	-0.0043816	1
0.1833	1.774	1.7811	-0.0071239	1
0.2	1.761	1.768	-0.0069641	1
0.2166	1.749	1.755	-0.0059795	1
0.2333	1.742	1.742	-1.2962E-005	1
0.25	1.717	1.7291	-0.012142	1
0.2666	1.714	1.7164	-0.0024427	1
0.2833	1.708	1.7038	0.0042391	1
0.3	1.695	1.6912	0.0038273	1
0.3166	1.676	1.6788	-0.0027521	1
0.3333	1.667	1.6663	0.00065128	1
0.4166	1.603	1.6058	-0.0028356	1
0.5	1.537	1.5475	-0.010451	1
0.5833	1.489	1.4913	-0.0022559	1
0.6666	1.432	1.4371	-0.0051012	1
0.75	1.388	1.3849	0.0031483	1
0.8333	1.334	1.3346	-0.00056106	1
0.9166	1.284	1.2861	-0.0020967	1
1	1.236	1.2393	-0.0033373	1
1.0833	1.195	1.1943	0.00066895	1
1.1666	1.154	1.151	0.0030408	1
1.25	1.107	1.1091	-0.002113	1
1.3333	1.066	1.0688	-0.0028358	1
1.4166	1.037	1.03	0.0069787	1
1.5	0.999	0.99257	0.0064278	1
1.5833	0.955	0.95653	-0.0015271	1
1.667	0.917	0.92163	-0.0046273	1
1.75	0.895	0.88828	0.0067231	1
1.833	0.863	0.85613	0.0068667	1

==========

RESULTS FROM VISUAL CURVE MATCHING

VISUAL MATCH PARAMETER ESTIMATES

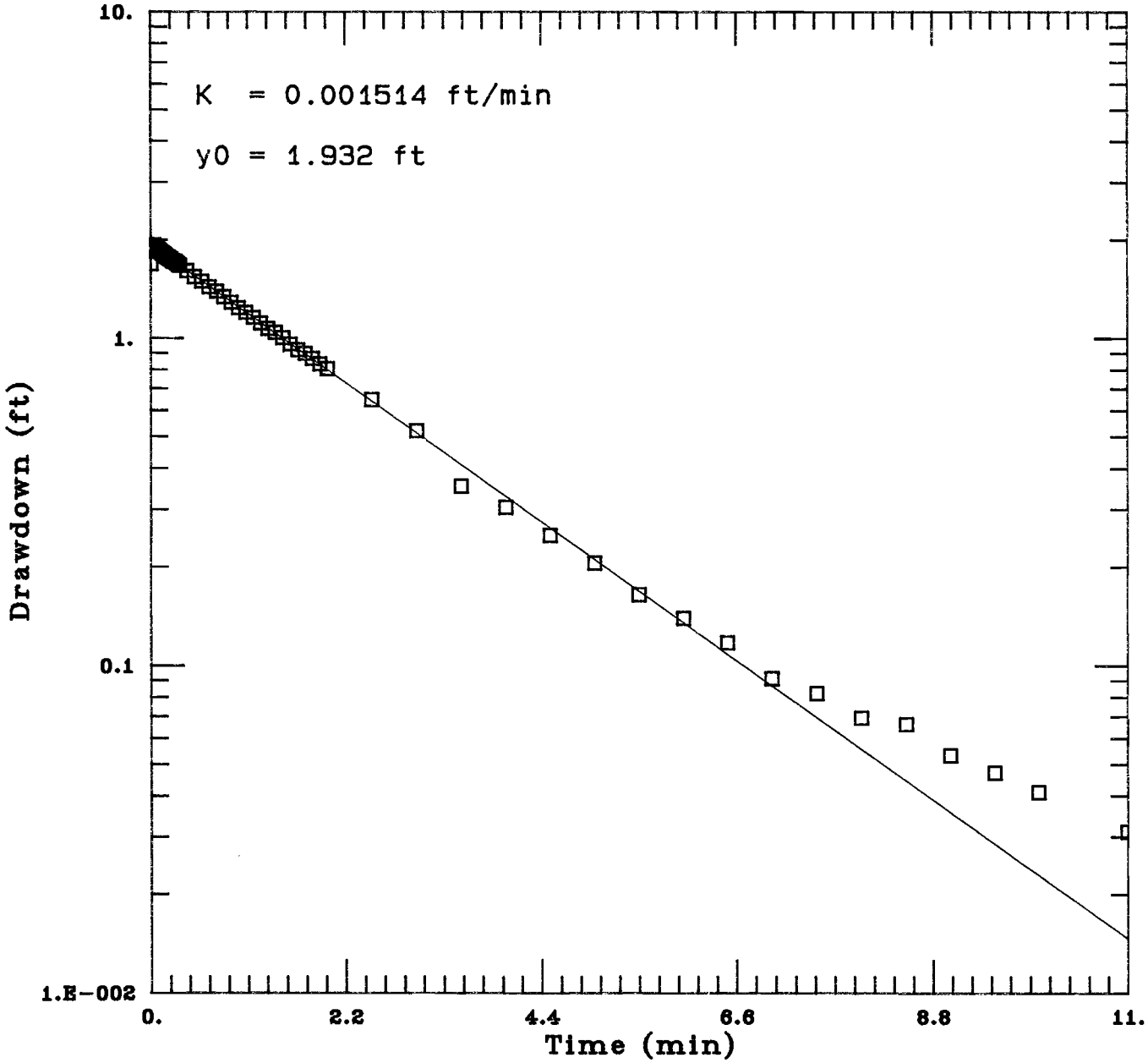
	Estimate
K =	1.5137E-003
y0 =	1.9322E+000

BOUWER-RICE SLUG TEST ANAL MW23 (test 1)

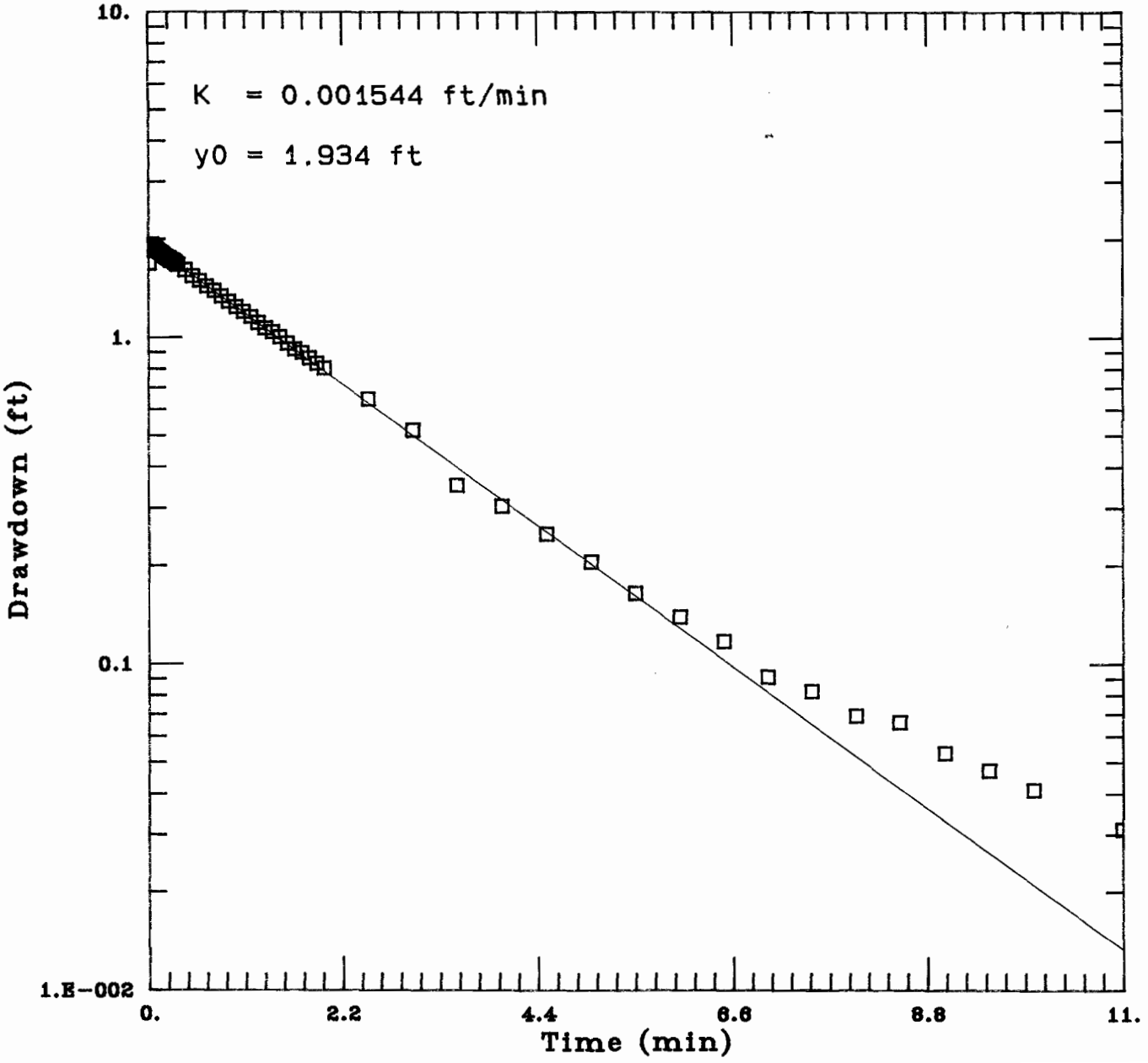
```
slugt1
3.46
0.167
0.417
slugt2
65.75
10
34.35
tsdata
0.0083    1.682    0
0.0166    1.885    0
0.025    1.907    0
0.0333    1.907    0
0.0416    1.923    1
0.05    1.891    1
0.0583    1.888    1
0.0666    1.882    1
0.075    1.866    1
0.0833    1.869    1
0.1    1.85    1
0.1166    1.834    1
0.1333    1.818    1
0.15    1.806    1
0.1666    1.79    1
0.1833    1.774    1
0.2    1.761    1
0.2166    1.749    1
0.2333    1.742    1
0.25    1.717    1
0.2666    1.714    1
0.2833    1.708    1
0.3    1.695    1
0.3166    1.676    1
0.3333    1.667    1
0.4166    1.603    1
0.5    1.537    1
0.5833    1.489    1
0.6666    1.432    1
0.75    1.388    1
0.8333    1.334    1
0.9166    1.284    1
1    1.236    1
1.0833    1.195    1
1.1666    1.154    1
1.25    1.107    1
1.3333    1.066    1
1.4166    1.037    1
1.5    0.999    1
1.5833    0.955    1
1.667    0.917    1
1.75    0.895    1
1.833    0.863    1
1.917    0.831    0
2    0.803    0
2.5    0.645    0
3    0.518    0
3.5    0.351    0
4    0.303    0
4.5    0.249    0
```

5	0.205	0
5.5	0.164	0
6	0.139	0
6.5	0.117	0
7	0.091	0
7.5	0.082	0
8	0.069	0
8.5	0.066	0
9	0.053	0
9.5	0.047	0
10	0.041	0
11	0.031	0

BOUWER-RICE SLUG TEST ANAL MW23 (test 1)



BOUWER-RICE SLUG TEST ANAL MW23 (test 1)



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PROBLEM DEFINITION

Problem title: BOUWER-RICE SLUG TEST ANAL MW23 (test 2)

Knowns and Constants:
- No. of data points.................. 63
- Radius of well casing............... 0.167
- Radius of well...................... 0.417
- Aquifer saturated thickness......... 65.75
- Well screen length.................. 10
- Static height of water in well...... 34.35
- Log(Re/Rw)........................... 2.445
- A, B, C............................. 2.262, 0.363, 0.000

==

ANALYTICAL METHOD

Bouwer and Rice (unconfined aquifer slug test)

==

RESULTS FROM STATISTICAL CURVE MATCHING

STATISTICAL MATCH PARAMETER ESTIMATES

	Estimate		Std. Error
K =	1.4409E-003	+/-	5.9771E-006
y0 =	2.0871E+000	+/-	2.6511E-003

ANALYSIS OF MODEL RESIDUALS

residual = calculated - observed
weighted residual = residual * weight

Weighted Residual Statistics:
- Number of residuals............... 61
- Number of estimated parameters.... 2
- Degrees of freedom................ 59
- Residual mean..................... 0.001013
- Residual standard deviation....... 0.01137
- Residual variance................. 0.0001294

Model Residuals:

Time	Observed	Calculated	Residual	Weight
0.0166	2.119	2.0725	0.046473	1

0.025	2.103	2.0652	0.037819	1
0.0333	2.087	2.0579	0.029052	1
0.0416	2.068	2.0507	0.017259	1
0.05	2.049	2.0435	0.0055281	1
0.0666	2.037	2.0292	0.0078167	1
0.075	2.024	2.022	0.002009	1
0.0833	2.011	2.0149	-0.0039094	1
0.1	1.996	2.0007	-0.0047359	1
0.1166	1.983	1.9867	-0.0037462	1
0.1333	1.97	1.9728	-0.0027708	1
0.15	1.951	1.9589	-0.0078938	1
0.1666	1.935	1.9452	-0.010197	1
0.1833	1.929	1.9315	-0.0025135	1
0.2	1.91	1.9179	-0.0079267	1
0.2166	1.894	1.9045	-0.010516	1
0.2333	1.882	1.8911	-0.009119	1
0.25	1.869	1.8778	-0.0088163	1
0.2666	1.853	1.8647	-0.011686	1
0.2833	1.837	1.8516	-0.014569	1
0.3	1.825	1.8385	-0.013545	1
0.3166	1.818	1.8257	-0.0076891	1
0.3333	1.799	1.8128	-0.013847	1
0.4166	1.746	1.7501	-0.004125	1
0.5	1.686	1.6895	-0.0035019	1
0.5833	1.632	1.631	0.00095235	1
0.6666	1.559	1.5746	-0.015616	1
0.75	1.515	1.5201	-0.0050723	1
0.8333	1.47	1.4675	0.0025199	1
0.9166	1.404	1.4167	-0.012707	1
1	1.369	1.3676	0.0013663	1
1.0833	1.312	1.3203	-0.0083157	1
1.1666	1.268	1.2746	-0.0066347	1
1.25	1.233	1.2305	0.0025177	1
1.3333	1.192	1.1879	0.0040905	1
1.4166	1.145	1.1468	-0.0018096	1
1.5	1.1	1.1071	-0.0070849	1
1.5833	1.066	1.0688	-0.0027814	1
1.6666	1.034	1.0318	0.0021968	1
1.75	0.996	0.99606	-6.227E-005	1
1.8333	0.964	0.9616	0.0024	1
1.9166	0.93	0.92833	0.0016699	1
2	0.901	0.89617	0.0048266	1
2.5	0.727	0.72544	0.0015572	1
3	0.594	0.58724	0.0067618	1
3.5	0.48	0.47536	0.0046369	1
4	0.392	0.3848	0.0071987	1
4.5	0.319	0.31149	0.0075074	1
5	0.259	0.25215	0.0068501	1
5.5	0.215	0.20411	0.010887	1
6	0.177	0.16523	0.011773	1
6.5	0.145	0.13375	0.01125	1
7	0.117	0.10827	0.0087312	1
7.5	0.091	0.087642	0.0033576	1
8	0.075	0.070946	0.0040544	1
8.5	0.063	0.05743	0.0055703	1
9	0.047	0.046489	0.00051126	1
9.5	0.037	0.037632	-0.00063214	1
10	0.031	0.030463	0.00053718	1
11	0.022	0.019961	0.0020385	1
12	0.015	0.01308	0.0019198	1

==========

RESULTS FROM VISUAL CURVE MATCHING

VISUAL MATCH PARAMETER ESTIMATES

	Estimate
K =	1.4409E-003
y0 =	2.0871E+000

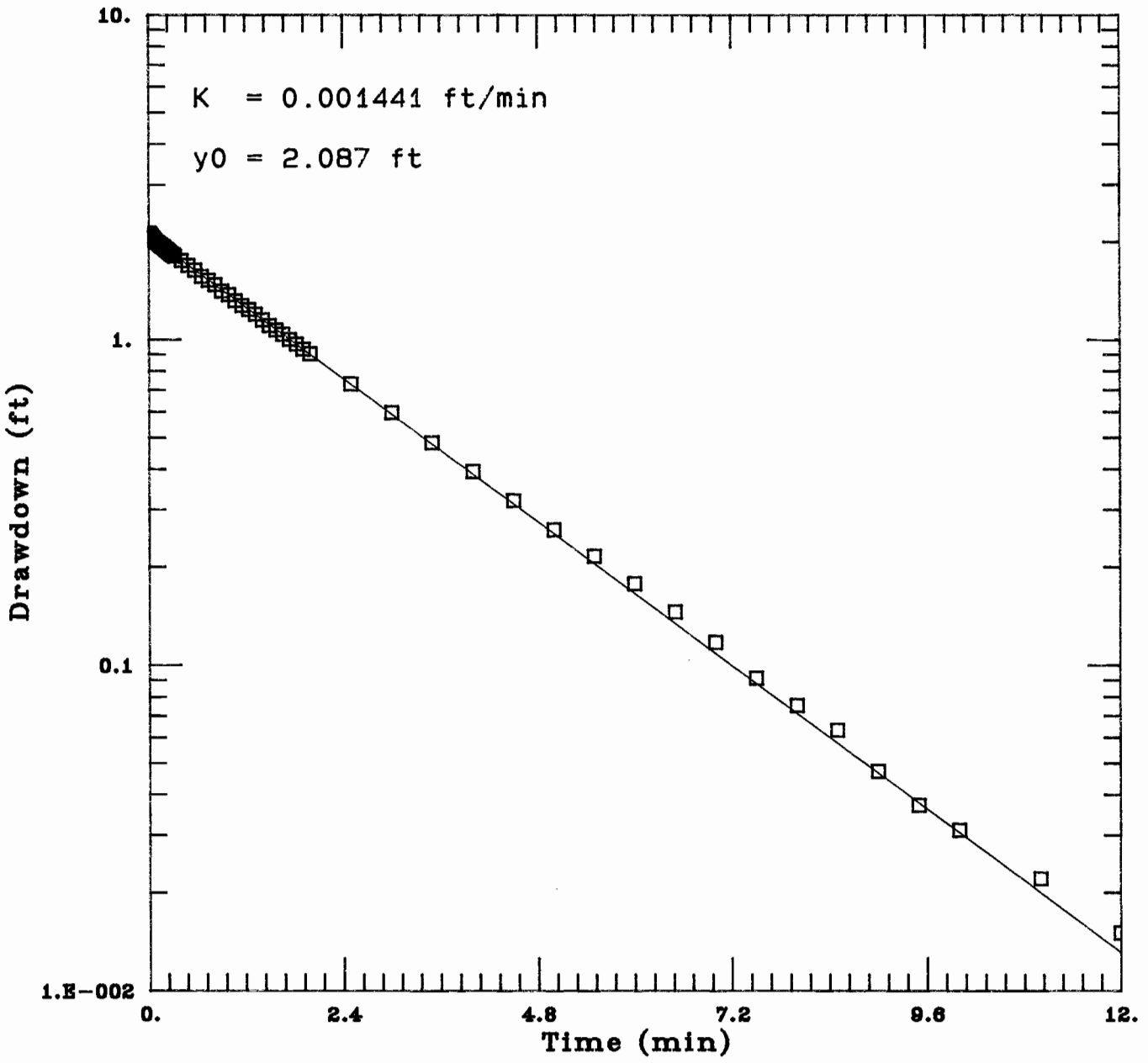
BOUWER-RICE SLUG TEST ANAL MW23 (test 2)

slugt1
3.137
0.167
0.417
slugt2
65.75
10
34.35
tsdata

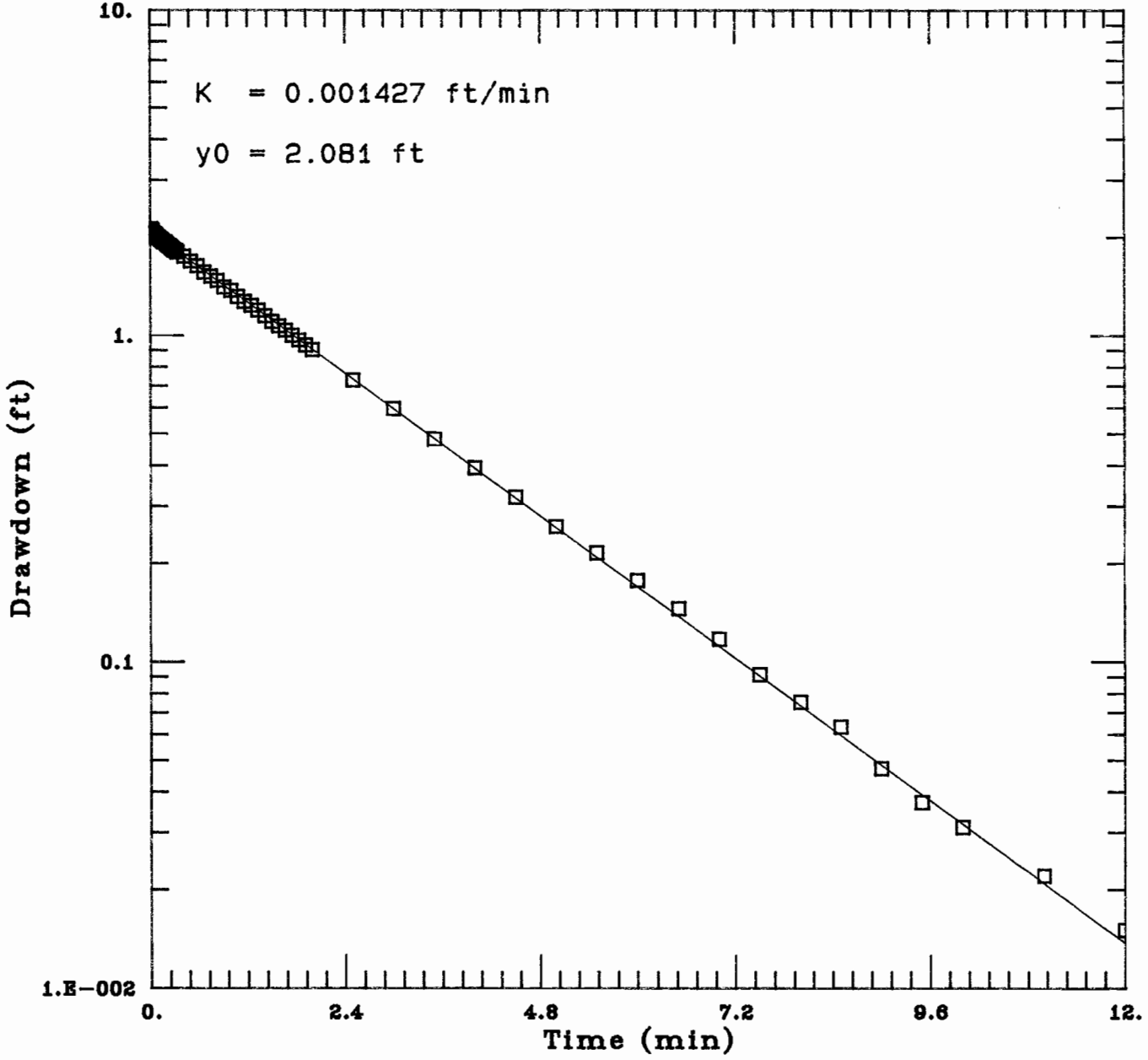
0.0083	2.046	0
0.0166	2.119	1
0.025	2.103	1
0.0333	2.087	1
0.0416	2.068	1
0.05	2.049	1
0.0583	2.049	0
0.0666	2.037	1
0.075	2.024	1
0.0833	2.011	1
0.1	1.996	1
0.1166	1.983	1
0.1333	1.97	1
0.15	1.951	1
0.1666	1.935	1
0.1833	1.929	1
0.2	1.91	1
0.2166	1.894	1
0.2333	1.882	1
0.25	1.869	1
0.2666	1.853	1
0.2833	1.837	1
0.3	1.825	1
0.3166	1.818	1
0.3333	1.799	1
0.4166	1.746	1
0.5	1.686	1
0.5833	1.632	1
0.6666	1.559	1
0.75	1.515	1
0.8333	1.47	1
0.9166	1.404	1
1	1.369	1
1.0833	1.312	1
1.1666	1.268	1
1.25	1.233	1
1.3333	1.192	1
1.4166	1.145	1
1.5	1.1	1
1.5833	1.066	1
1.6666	1.034	1
1.75	0.996	1
1.8333	0.964	1
1.9166	0.93	1
2	0.901	1
2.5	0.727	1
3	0.594	1
3.5	0.48	1
4	0.392	1
4.5	0.319	1

5	0.259	1
5.5	0.215	1
6	0.177	1
6.5	0.145	1
7	0.117	1
7.5	0.091	1
8	0.075	1
8.5	0.063	1
9	0.047	1
9.5	0.037	1
10	0.031	1
11	0.022	1
12	0.015	1

BOUWER-RICE SLUG TEST ANAL MW23 (test 2)



BOUWER-RICE SLUG TEST ANAL MW23 (test 2)



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A Q T E S O L V   R E S U L T S

03/16/91 15:54:36

PROBLEM DEFINITION

Problem title: BOUWER-RICE SLUG TEST ANAL MW27 (test1)

Knowns and Constants:
- No. of data points.................. 34
- Radius of well casing............... 0.268
- Radius of well...................... 0.417
- Aquifer saturated thickness......... 62.96
- Well screen length.................. 10
- Static height of water in well...... 9.41
- Log(Re/Rw).......................... 1.92
- A, B, C............................. 2.262, 0.363, 0.000

ANALYTICAL METHOD

Bouwer and Rice (unconfined aquifer slug test)

RESULTS FROM STATISTICAL CURVE MATCHING

STATISTICAL MATCH PARAMETER ESTIMATES

	Estimate		Std. Error
K =	4.2778E-002	+/-	4.3378E-004
y0 =	2.7164E+000	+/-	1.9705E-002

ANALYSIS OF MODEL RESIDUALS

residual = calculated - observed
weighted residual = residual * weight

Weighted Residual Statistics:
- Number of residuals............... 18
- Number of estimated parameters.... 2
- Degrees of freedom................ 16
- Residual mean..................... 0.001398
- Residual standard deviation....... 0.01832
- Residual variance................. 0.0003355

Model Residuals:

Time	Observed	Calculated	Residual	Weight
0.05	1.996	1.992	0.0040094	1

0.0583	1.916	1.892	0.023976	1
0.0666	1.815	1.7971	0.017926	1
0.075	1.708	1.7058	0.0021694	1
0.0833	1.625	1.6202	0.0047753	1
0.1	1.439	1.4608	-0.021779	1
0.1166	1.284	1.3178	-0.033842	1
0.1333	1.164	1.1882	-0.024153	1
0.15	1.056	1.0712	-0.015228	1
0.1666	0.955	0.96641	-0.011408	1
0.1833	0.863	0.8713	-0.0083041	1
0.2	0.781	0.78556	-0.0045594	1
0.2166	0.711	0.70869	0.0023077	1
0.2333	0.648	0.63895	0.0090498	1
0.25	0.591	0.57607	0.014929	1
0.2666	0.537	0.5197	0.017297	1
0.2833	0.49	0.46856	0.021441	1
0.3	0.449	0.42245	0.026552	1

==========

RESULTS FROM VISUAL CURVE MATCHING

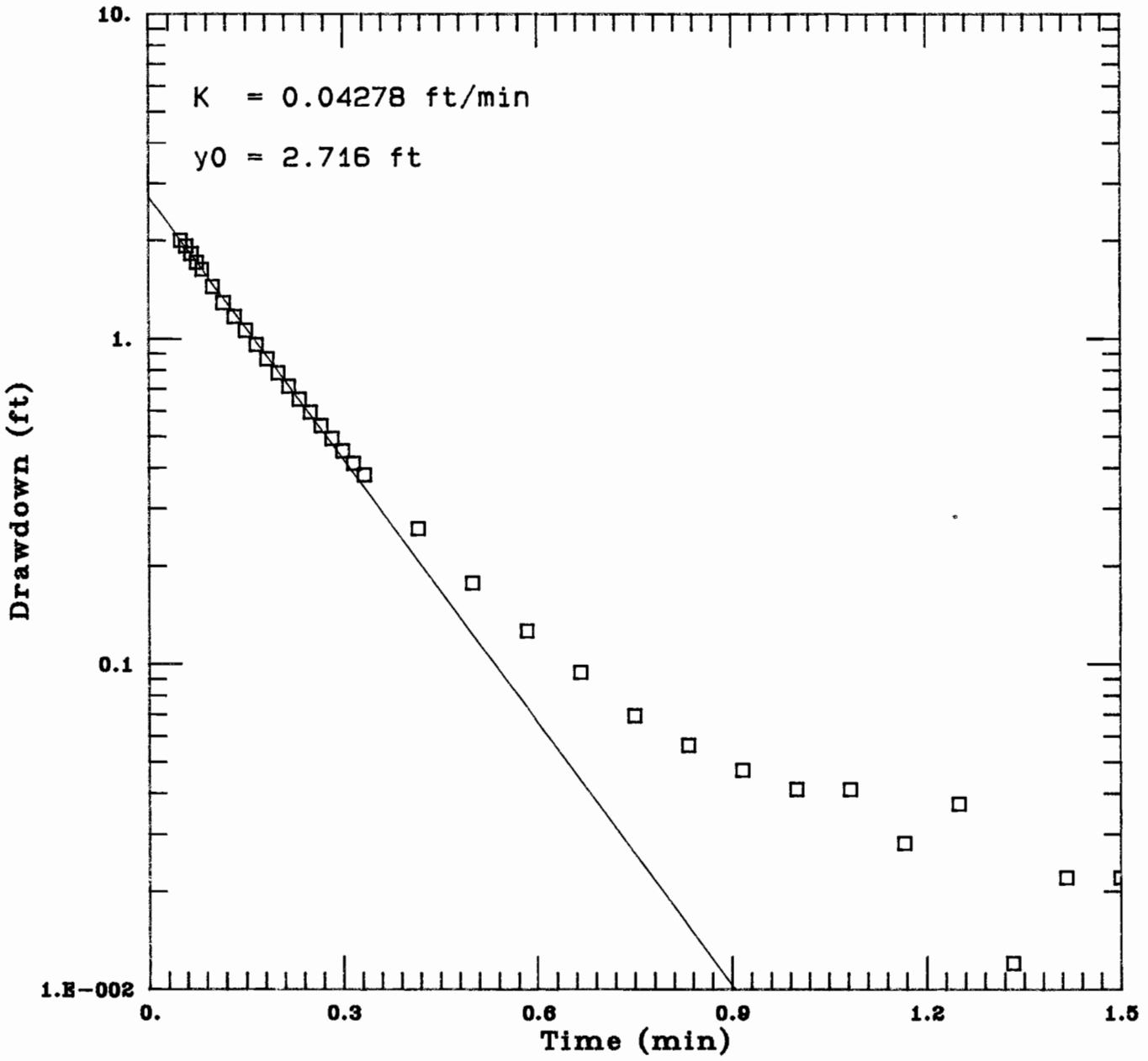
VISUAL MATCH PARAMETER ESTIMATES

	Estimate
K =	4.2778E-002
y0 =	2.7164E+000

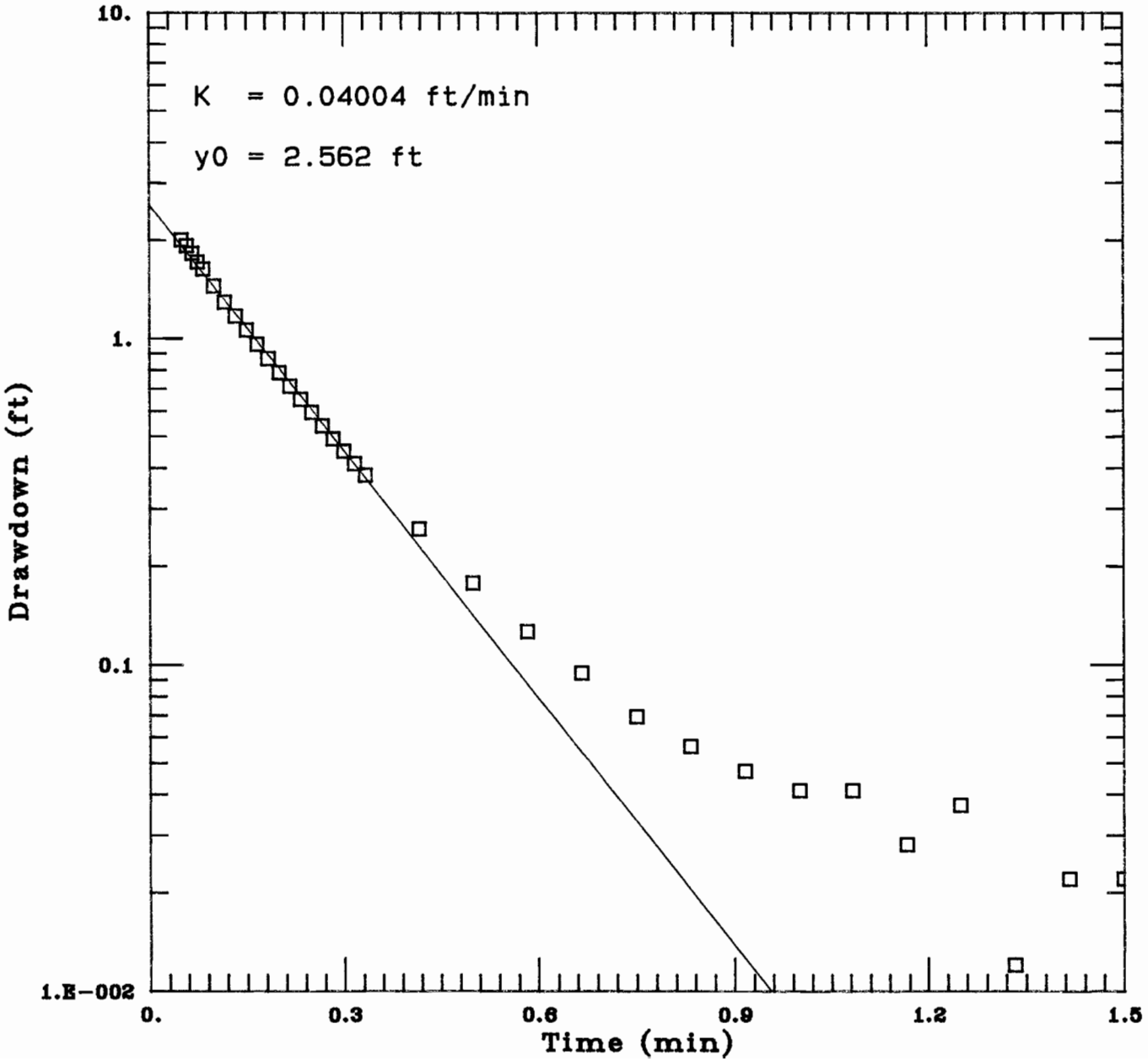
BOUWER-RICE SLUG TEST ANAL MW27 (test1)

```
slugt1
1.996
0.268
0.417
slugt2
62.96
10
9.41
tsdata
0.05   1.996   1
0.0583   1.916   1
0.0666   1.815   1
0.075   1.708   1
0.0833   1.625   1
0.1   1.439   1
0.1166   1.284   1
0.1333   1.164   1
0.15   1.056   1
0.1666   0.955   1
0.1833   0.863   1
0.2   0.781   1
0.2166   0.711   1
0.2333   0.648   1
0.25   0.591   1
0.2666   0.537   1
0.2833   0.49   1
0.3   0.449   1
0.3166   0.411   0
0.3333   0.379   0
0.4166   0.259   0
0.5   0.177   0
0.5833   0.126   0
0.6666   0.094   0
0.75   0.069   0
0.8333   0.056   0
0.9166   0.047   0
1   0.041   0
1.0833   0.041   0
1.1666   0.028   0
1.25   0.037   0
1.3333   0.012   0
1.4166   0.022   0
1.5   0.022   0
```

BOUWER-RICE SLUG TEST ANAL MW27 (test1)



BOUWER-RICE SLUG TEST ANAL MW27 (test1)



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03/16/91 15:49:36

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PROBLEM DEFINITION

Problem title: BOUWER-RICE SLUG TEST ANAL MW27 (test2)

Knowns and Constants:
- No. of data points.................. 46
- Radius of well casing............... 0.268
- Radius of well...................... 0.417
- Aquifer saturated thickness......... 62.96
- Well screen length.................. 10
- Static height of water in well...... 9.41
- Log(Re/Rw).......................... 1.92
- A, B, C............................. 2.262, 0.363, 0.000

==

ANALYTICAL METHOD

Bouwer and Rice (unconfined aquifer slug test)

==

RESULTS FROM STATISTICAL CURVE MATCHING

STATISTICAL MATCH PARAMETER ESTIMATES

	Estimate		Std. Error
K =	4.2766E-002	+/-	4.6424E-004
y0 =	2.2216E+000	+/-	1.4434E-002

ANALYSIS OF MODEL RESIDUALS

residual = calculated - observed
weighted residual = residual * weight

Weighted Residual Statistics:
- Number of residuals............... 22
- Number of estimated parameters.... 2
- Degrees of freedom................ 20
- Residual mean..................... 0.001964
- Residual standard deviation....... 0.02043
- Residual variance................. 0.0004175

Model Residuals:

Time	Observed	Calculated	Residual	Weight
0.025	1.951	1.9025	0.04848	1

0.0333	1.818	1.8071	0.01093	1
0.0416	1.701	1.7164	-0.015409	1
0.05	1.638	1.6293	0.0087142	1
0.0583	1.562	1.5475	0.014456	1
0.0666	1.455	1.4699	-0.014904	1
0.075	1.379	1.3953	-0.016293	1
0.0833	1.296	1.3253	-0.029291	1
0.1	1.17	1.1949	-0.024905	1
0.1166	1.056	1.078	-0.022015	1
0.1333	0.955	0.97196	-0.016957	1
0.15	0.866	0.87633	-0.010334	1
0.1666	0.781	0.79061	-0.0096077	1
0.1833	0.711	0.71283	-0.0018256	1
0.2	0.648	0.6427	0.0053041	1
0.2166	0.585	0.57983	0.0051747	1
0.2333	0.531	0.52278	0.0082195	1
0.25	0.483	0.47135	0.011652	1
0.2666	0.442	0.42524	0.016761	1
0.2833	0.408	0.3834	0.024597	1
0.3	0.37	0.34568	0.024317	1
0.3166	0.338	0.31187	0.026133	1

==========

RESULTS FROM VISUAL CURVE MATCHING

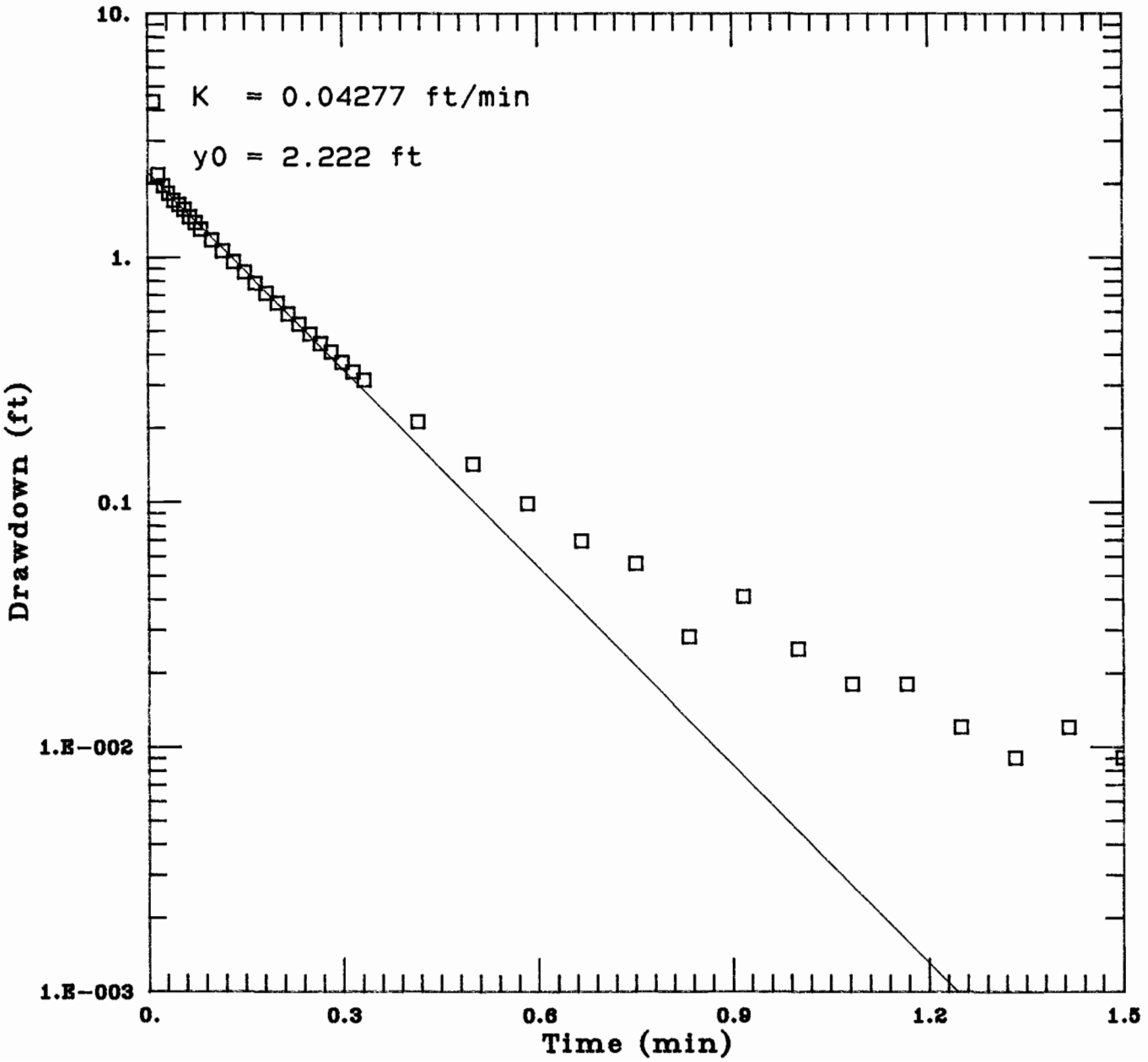
VISUAL MATCH PARAMETER ESTIMATES

	Estimate
K =	4.2766E-002
y0 =	2.2216E+000

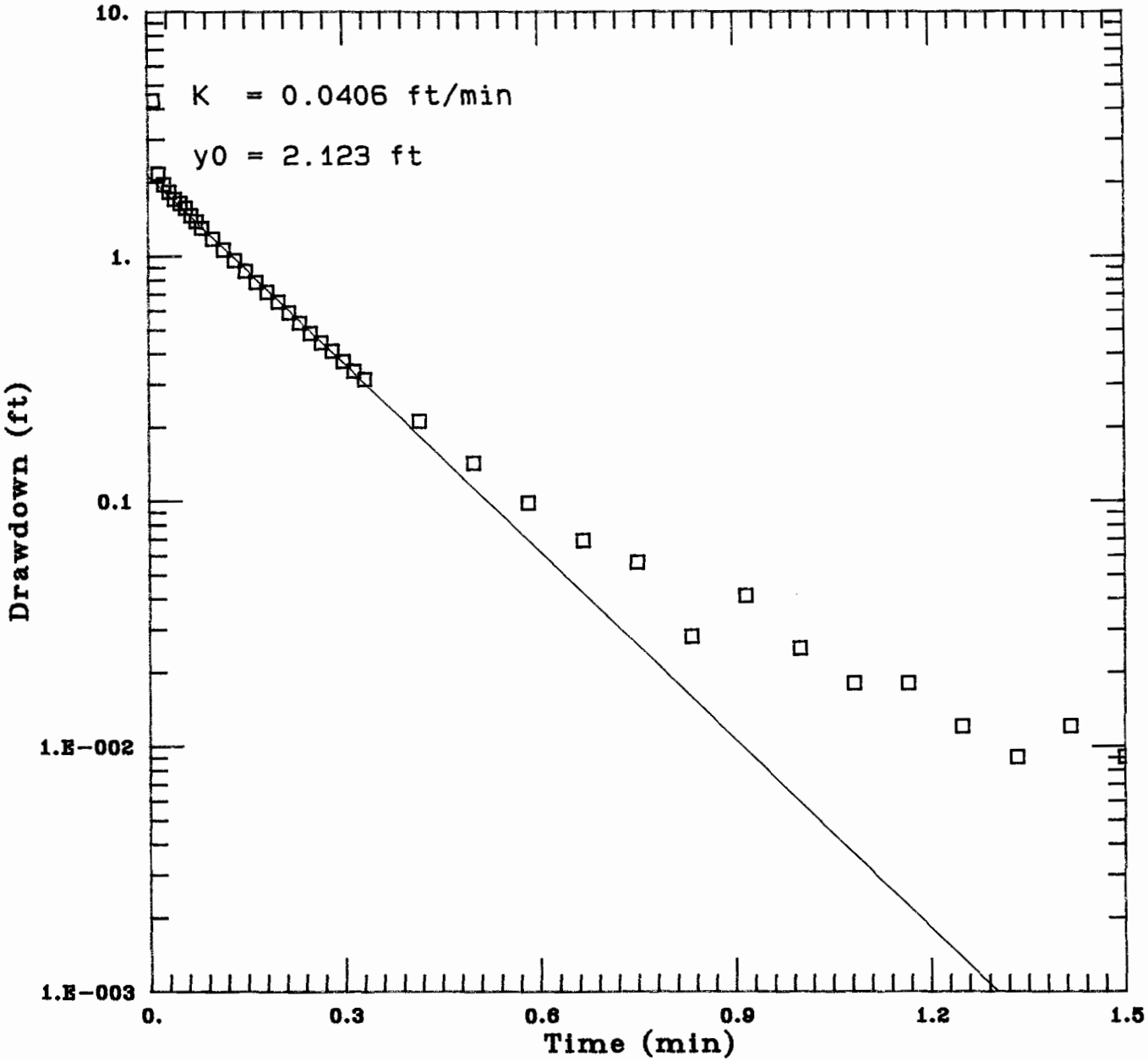
BOUWER-RICE SLUG TEST ANAL MW27 (test2)

```
slugt1
4.317
0.268
0.417
slugt2
62.96
10
9.41
tsdata
0.0083    4.317    0
0.0166    2.163    0
0.025    1.951    1
0.0333    1.818    1
0.0416    1.701    1
0.05    1.638    1
0.0583    1.562    1
0.0666    1.455    1
0.075    1.379    1
0.0833    1.296    1
0.1    1.17    1
0.1166    1.056    1
0.1333    0.955    1
0.15    0.866    1
0.1666    0.781    1
0.1833    0.711    1
0.2    0.648    1
0.2166    0.585    1
0.2333    0.531    1
0.25    0.483    1
0.2666    0.442    1
0.2833    0.408    1
0.3    0.37    1
0.3166    0.338    1
0.3333    0.313    0
0.4166    0.211    0
0.5    0.142    0
0.5833    0.098    0
0.6666    0.069    0
0.75    0.056    0
0.8333    0.028    0
0.9166    0.041    0
1    0.025    0
1.0833    0.018    0
1.1666    0.018    0
1.25    0.012    0
1.3333    0.009    0
1.4166    0.012    0
1.5    0.009    0
1.5833    0.009    0
1.6666    0.006    0
1.75    0.006    0
1.8333    0.009    0
1.9166    0.006    0
2    0.006    0
2.5    0.003    0
```

BOUWER-RICE SLUG TEST ANAL MW27 (test2)



BOUWER-RICE SLUG TEST ANAL MW27 (test2)



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03/19/91 11:21:33

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PROBLEM DEFINITION

Problem title: BOUWER-RICE SLUG TEST ANAL MW28 (test1)

Knowns and Constants:
- No. of data points.................. 71
- Radius of well casing............... 0.268
- Radius of well...................... 0.417
- Aquifer saturated thickness......... 62.87
- Well screen length.................. 10
- Static height of water in well...... 9.48
- Log(Re/Rw)........................... 1.924
- A, B, C.............................. 2.262, 0.363, 0.000

==

ANALYTICAL METHOD

Bouwer and Rice (unconfined aquifer slug test)

==

RESULTS FROM STATISTICAL CURVE MATCHING

STATISTICAL MATCH PARAMETER ESTIMATES

	Estimate		Std. Error
K =	3.3526E-004	+/-	1.0725E-005
y0 =	1.5214E+000	+/-	5.3032E-003

ANALYSIS OF MODEL RESIDUALS

residual = calculated - observed
weighted residual = residual * weight

Weighted Residual Statistics:
- Number of residuals............... 21
- Number of estimated parameters.... 2
- Degrees of freedom................ 19
- Residual mean..................... 1.127E-005
- Residual standard deviation....... 0.01085
- Residual variance................. 0.0001177

Model Residuals:

Time	Observed	Calculated	Residual	Weight
0.8333	1.493	1.4611	0.031909	1

0.9166	1.474	1.4552	0.018804	1
1	1.458	1.4493	0.0086827	1
1.0833	1.445	1.4435	0.0015303	1
1.1666	1.436	1.4376	-0.0016458	1
1.25	1.426	1.4318	-0.0058383	1
1.3333	1.417	1.4261	-0.0090613	1
1.4166	1.41	1.4203	-0.010308	1
1.5	1.407	1.4146	-0.0075701	1
1.5833	1.401	1.4089	-0.0078627	1
1.6666	1.398	1.4032	-0.0051784	1
1.75	1.395	1.3975	-0.0025101	1
1.8333	1.385	1.3919	-0.0068716	1
1.9166	1.379	1.3863	-0.0072558	1
2	1.376	1.3807	-0.0046559	1
2.5	1.338	1.3476	-0.0095549	1
3	1.312	1.3152	-0.0032474	1
3.5	1.284	1.2837	0.00028552	1
4	1.255	1.2529	0.0020624	1
4.5	1.23	1.2229	0.0071015	1
5	1.205	1.1936	0.01142	1

==========

RESULTS FROM VISUAL CURVE MATCHING

VISUAL MATCH PARAMETER ESTIMATES

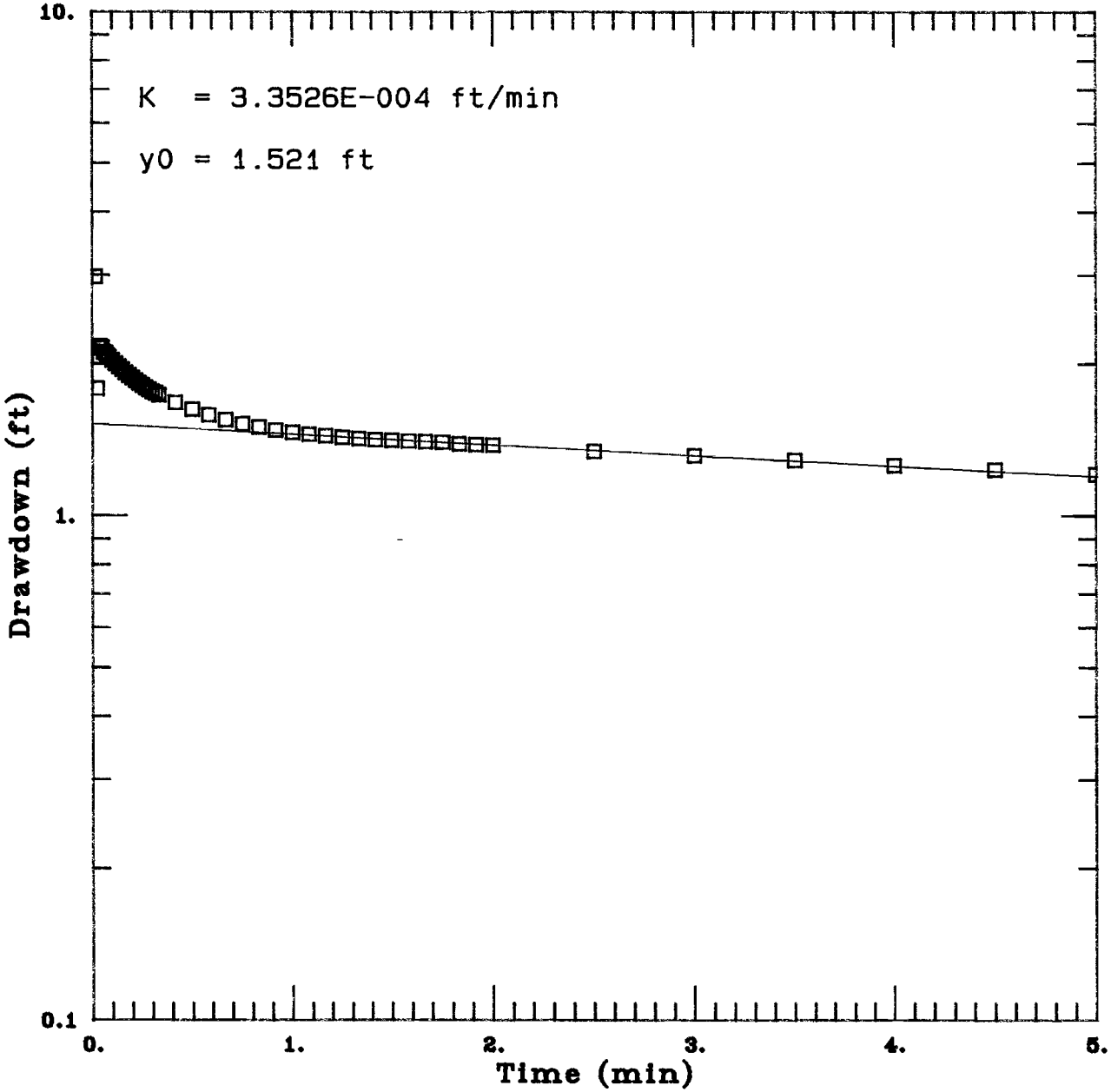
	Estimate
K =	3.3526E-004
y0 =	1.5214E+000

BOUWER-RICE SLUG TEST ANAL MW28 (test1)

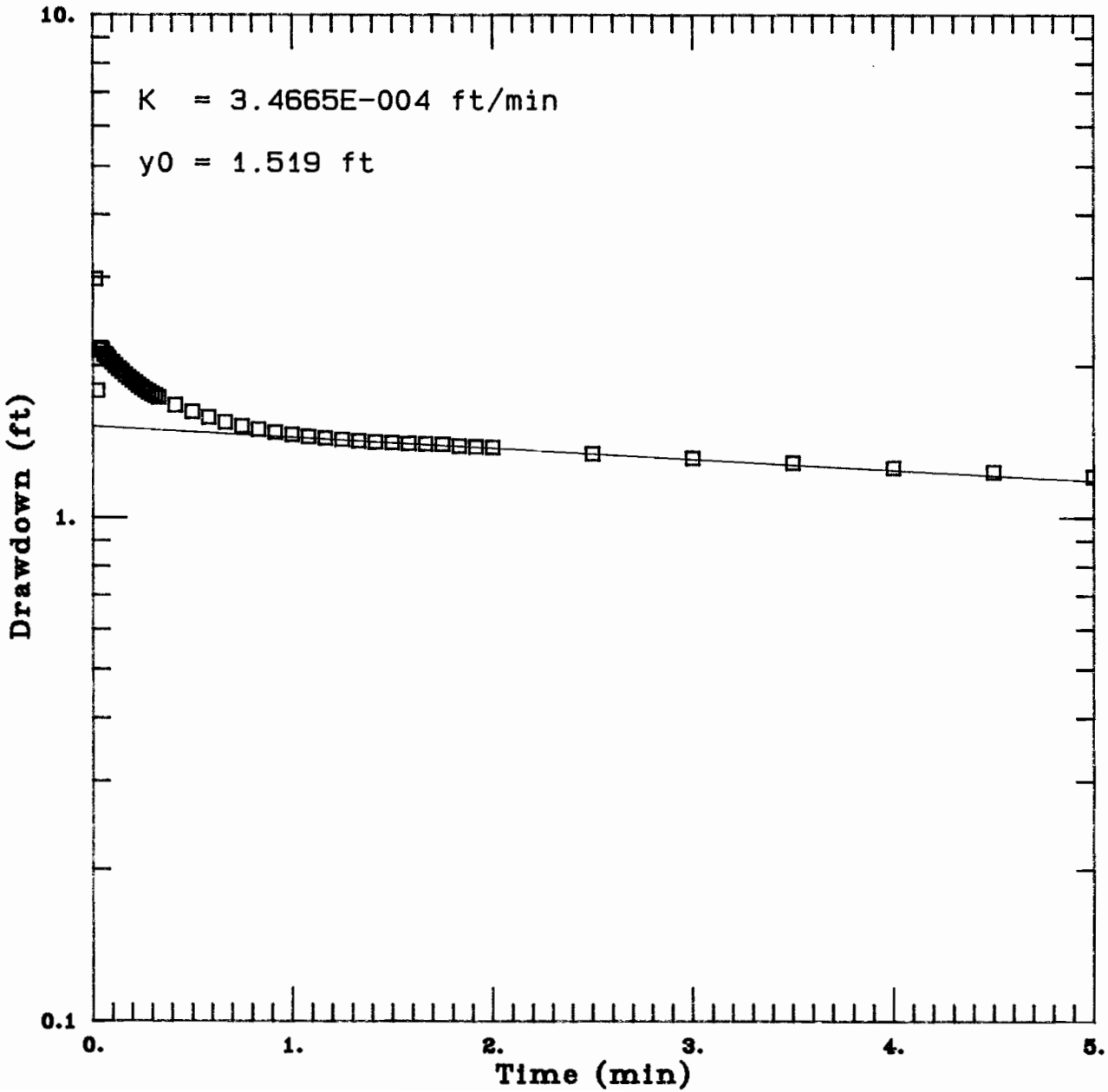
```
slugt1
2.967
0.268
0.417
slugt2
62.87
10
9.48
tsdata
0.0166    2.967    0
0.025    1.78    0
0.0333    2.144    0
0.0416    2.163    0
0.05    2.151    0
0.0583    2.106    0
0.0666    2.1    0
0.075    2.078    0
0.0833    2.062    0
0.1    2.03    0
0.1166    1.999    0
0.1333    1.97    0
0.15    1.945    0
0.1666    1.916    0
0.1833    1.894    0
0.2    1.872    0
0.2166    1.85    0
0.2333    1.828    0
0.25    1.809    0
0.2666    1.79    0
0.2833    1.774    0
0.3    1.758    0
0.3166    1.746    0
0.3333    1.73    0
0.4166    1.67    0
0.5    1.619    0
0.5833    1.578    0
0.6666    1.543    0
0.75    1.515    0
0.8333    1.493    1
0.9166    1.474    1
1    1.458    1
1.0833    1.445    1
1.1666    1.436    1
1.25    1.426    1
1.3333    1.417    1
1.4166    1.41    1
1.5    1.407    1
1.5833    1.401    1
1.6666    1.398    1
1.75    1.395    1
1.8333    1.385    1
1.9166    1.379    1
2    1.376    1
2.5    1.338    1
3    1.312    1
3.5    1.284    1
4    1.255    1
4.5    1.23    1
5    1.205    1
```

5.5	1.179	0
6	1.16	0
6.5	1.135	0
7	1.113	0
7.5	1.097	0
8	1.072	0
8.5	1.05	0
9	1.031	0
9.5	1.012	0
10	0.993	0
11	0.955	0
12	0.92	0
13	0.882	0
14	0.854	0
15	0.819	0
16	0.79	0
17	0.759	0
18	0.737	0
19	0.708	0
20	0.683	0
21	0.664	0

BOUWER-RICE SLUG TEST ANAL MW28 (test1)



BOUWER-RICE SLUG TEST ANAL MW28 (test1)



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03/17/91 11:32:14

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PROBLEM DEFINITION

Problem title: BOUWER-RICE SLUG TEST ANAL MW28 (test2)

Knowns and Constants:
- No. of data points.................. 67
- Radius of well casing............... 0.268
- Radius of well...................... 0.417
- Aquifer saturated thickness......... 62.87
- Well screen length.................. 10
- Static height of water in well...... 9.48
- Log(Re/Rw)........................... 1.924
- A, B, C............................. 2.262, 0.363, 0.000

==

ANALYTICAL METHOD

Bouwer and Rice (unconfined aquifer slug test)

==

RESULTS FROM STATISTICAL CURVE MATCHING

STATISTICAL MATCH PARAMETER ESTIMATES

	Estimate		Std. Error
K =	3.1708E-004	+/-	1.2549E-006
y0 =	2.2443E+000	+/-	1.9975E-003

ANALYSIS OF MODEL RESIDUALS

residual = calculated - observed
weighted residual = residual * weight

Weighted Residual Statistics:
- Number of residuals............... 42
- Number of estimated parameters.... 2
- Degrees of freedom................ 40
- Residual mean..................... 0.0001234
- Residual standard deviation....... 0.007781
- Residual variance................. 6.054E-005

Model Residuals:

Time	Observed	Calculated	Residual	Weight
0.4166	2.217	2.2018	0.015191	1

0.5	2.207	2.1934	0.013604	1
0.5833	2.195	2.185	0.009975	1
0.6666	2.185	2.1767	0.0083138	1
0.75	2.176	2.1684	0.0076307	1
0.8333	2.166	2.1601	0.0059059	1
0.9166	2.157	2.1519	0.0051495	1
1	2.144	2.1436	0.00037154	1
1.0833	2.141	2.1354	0.0055523	1
1.1666	2.132	2.1273	0.0047019	1
1.25	2.119	2.1192	-0.00016989	1
1.3333	2.109	2.1111	-0.0020824	1
1.4166	2.103	2.103	-2.5843E-005	1
1.5	2.097	2.095	0.0020096	1
1.5833	2.084	2.087	-0.0029952	1
1.6666	2.078	2.079	-0.0010305	1
1.75	2.068	2.0711	-0.0030868	1
1.8333	2.059	2.0632	-0.0041828	1
1.9166	2.049	2.0553	-0.006309	1
2	2.043	2.0475	-0.0044559	1
2.5	1.992	2.001	-0.0089999	1
3	1.948	1.9556	-0.0075981	1
3.5	1.901	1.9112	-0.010226	1
4	1.86	1.8679	-0.0078614	1
4.5	1.818	1.8255	-0.0074803	1
5	1.774	1.7841	-0.010061	1
5.5	1.733	1.7436	-0.010581	1
6	1.695	1.704	-0.0090201	1
6.5	1.66	1.6654	-0.0053566	1
7	1.619	1.6276	-0.0085703	1
7.5	1.584	1.5906	-0.0066414	1
8	1.55	1.5546	-0.0045504	1
8.5	1.515	1.5193	-0.0042783	1
9	1.483	1.4848	-0.0018064	1
9.5	1.451	1.4511	-0.00011678	1
10	1.417	1.4182	-0.0011915	1
11	1.357	1.3546	0.0024348	1
12	1.296	1.2938	0.0022065	1
13	1.243	1.2357	0.0072517	1
14	1.192	1.1803	0.011693	1
15	1.145	1.1274	0.017647	1
16	1.091	1.0768	0.014225	1

==========

RESULTS FROM VISUAL CURVE MATCHING

VISUAL MATCH PARAMETER ESTIMATES

	Estimate
K =	3.1708E-004
y0 =	2.2443E+000

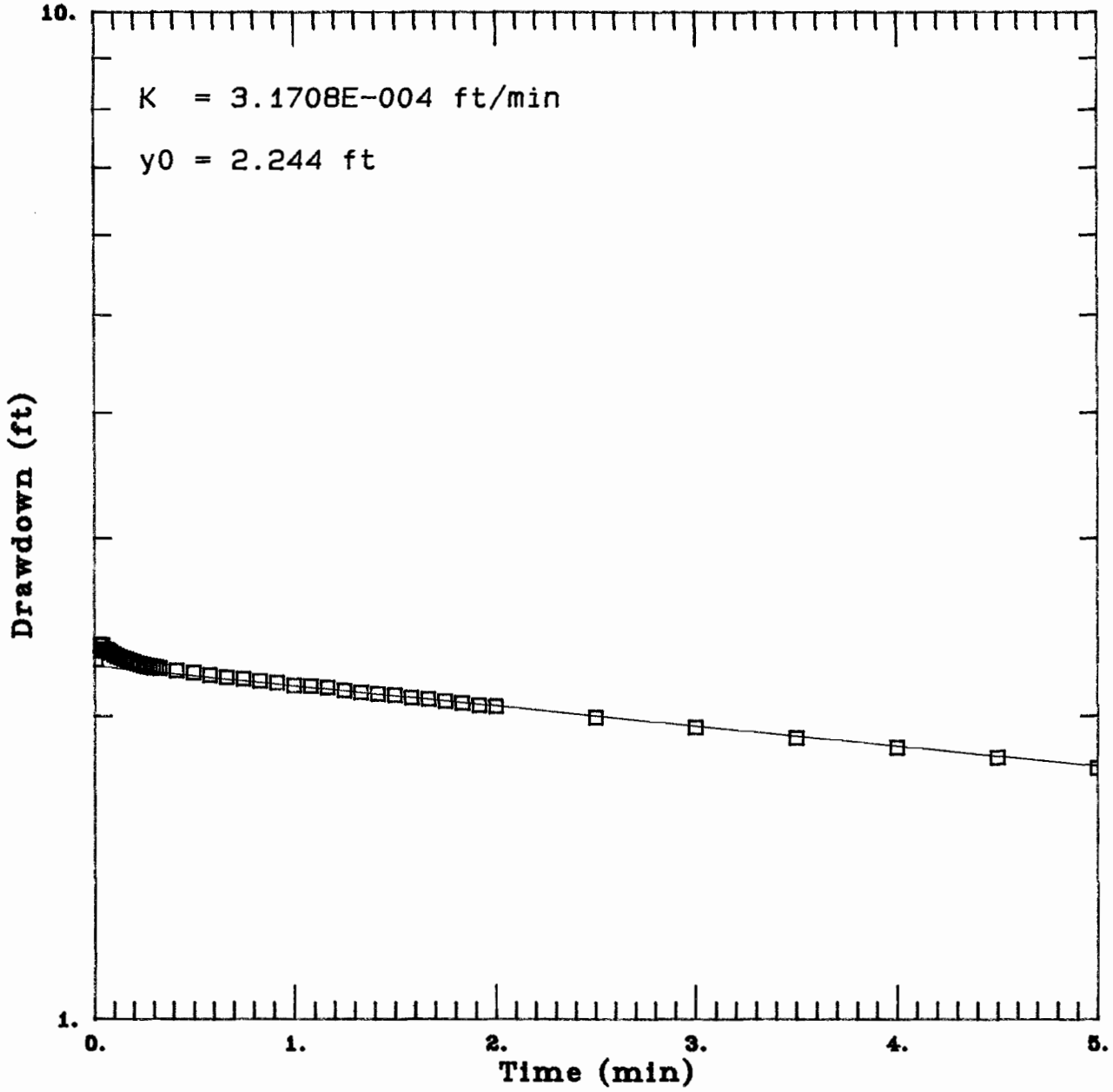
BOUWER-RICE SLUG TEST ANAL MW28 (test2)

slugt1
4.953
0.268
0.417
slugt2
62.87
10
9.48
tsdata

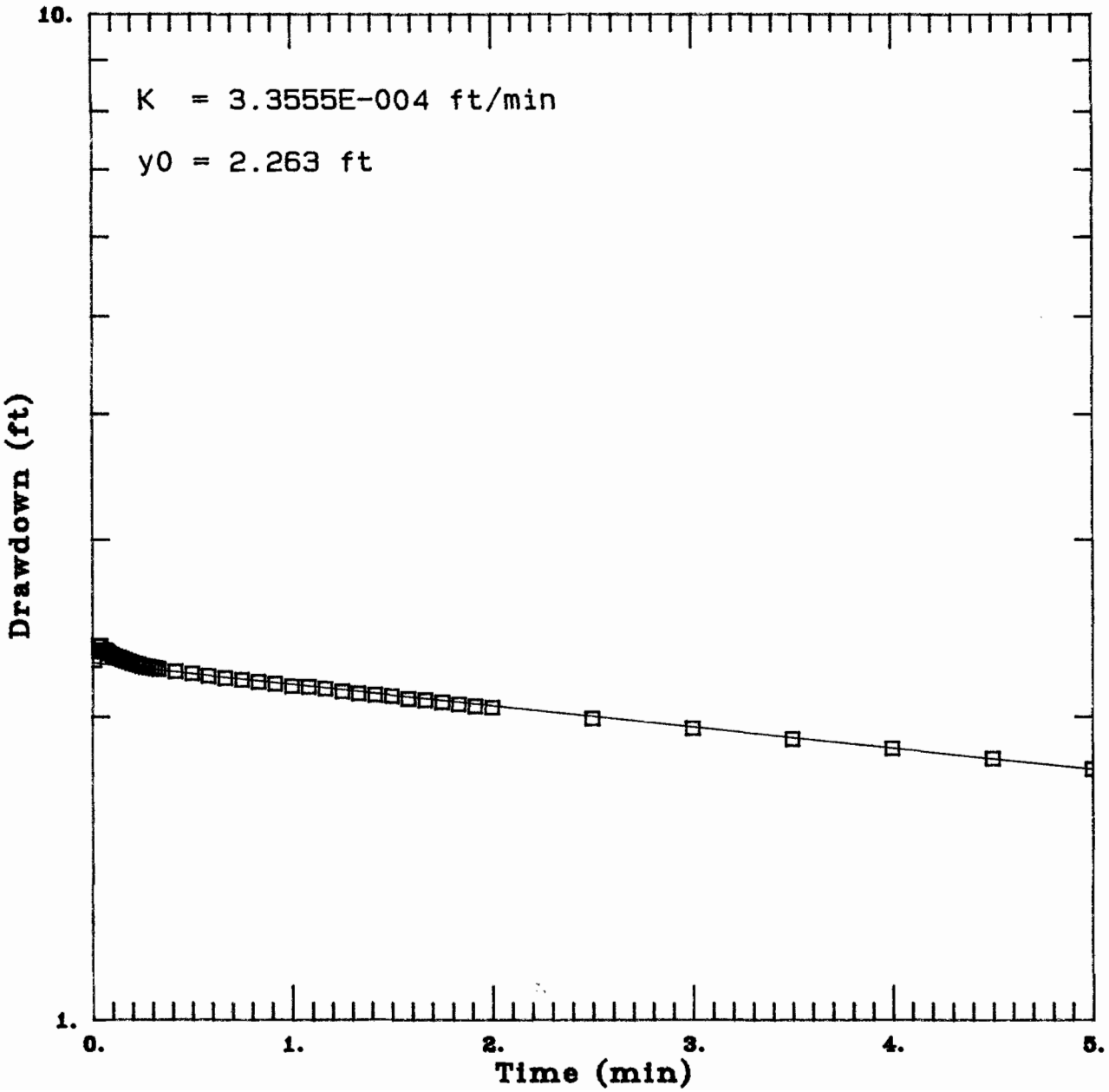
0.0083	2.274	0
0.0166	2.321	0
0.025	2.356	0
0.0333	2.35	0
0.0416	2.35	0
0.05	2.328	0
0.0583	2.321	0
0.0666	2.325	0
0.075	2.318	0
0.0833	2.312	0
0.1	2.302	0
0.1166	2.293	0
0.1333	2.287	0
0.15	2.28	0
0.1666	2.274	0
0.1833	2.268	0
0.2	2.261	0
0.2166	2.255	0
0.2333	2.252	0
0.25	2.245	0
0.2666	2.242	0
0.2833	2.239	0
0.3	2.236	0
0.3166	2.233	0
0.3333	2.23	0
0.4166	2.217	1
0.5	2.207	1
0.5833	2.195	1
0.6666	2.185	1
0.75	2.176	1
0.8333	2.166	1
0.9166	2.157	1
1	2.144	1
1.0833	2.141	1
1.1666	2.132	1
1.25	2.119	1
1.3333	2.109	1
1.4166	2.103	1
1.5	2.097	1
1.5833	2.084	1
1.6666	2.078	1
1.75	2.068	1
1.8333	2.059	1
1.9166	2.049	1
2	2.043	1
2.5	1.992	1
3	1.948	1
3.5	1.901	1
4	1.86	1
4.5	1.818	1

5	1.774	1
5.5	1.733	1
6	1.695	1
6.5	1.66	1
7	1.619	1
7.5	1.584	1
8	1.55	1
8.5	1.515	1
9	1.483	1
9.5	1.451	1
10	1.417	1
11	1.357	1
12	1.296	1
13	1.243	1
14	1.192	1
15	1.145	1
16	1.091	1

BOUWER-RICE SLUG TEST ANAL MW28 (test2)



BOUWER-RICE SLUG TEST ANAL MW28 (test2)



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A Q T E S O L V   R E S U L T S

03/17/91 13:28:23

PROBLEM DEFINITION

Problem title: BOUWER-RICE SLUG TEST ANAL MW31 (test1)

Knowns and Constants:

```
   No. of data points.................. 38
   Radius of well casing............... 0.268
   Radius of well...................... 0.417
   Aquifer saturated thickness......... 61.4
   Well screen length.................. 10
   Static height of water in well...... 8.85
   Log(Re/Rw).......................... 1.896
   A, B, C.............................  2.262,  0.363,  0.000
```

ANALYTICAL METHOD

Bouwer and Rice (unconfined aquifer slug test)

RESULTS FROM STATISTICAL CURVE MATCHING

STATISTICAL MATCH PARAMETER ESTIMATES

```
           Estimate          Std. Error
   K  =   3.4140E-002 +/-   4.7394E-004
   y0 =   7.2851E-001 +/-   1.1386E-002
```

ANALYSIS OF MODEL RESIDUALS

residual = calculated - observed
weighted residual = residual * weight

Weighted Residual Statistics:

```
   Number of residuals............... 19
   Number of estimated parameters.... 2
   Degrees of freedom................ 17
   Residual mean..................... -2.428E-005
   Residual standard deviation....... 0.003721
   Residual variance................. 1.385E-005
```

Model Residuals:

Time	Observed	Calculated	Residual	Weight
0.15	0.351	0.34334	0.0076639	1

0.1666	0.313	0.31591	-0.0029098	1
0.1833	0.284	0.29053	-0.0065285	1
0.2	0.265	0.26719	-0.0021865	1
0.2166	0.246	0.24584	0.00015685	1
0.2333	0.224	0.22609	-0.0020913	1
0.25	0.208	0.20793	7.361E-005	1
0.2666	0.192	0.19132	0.00068317	1
0.2833	0.173	0.17595	-0.0029458	1
0.3	0.167	0.16181	0.0051903	1
0.3166	0.151	0.14888	0.0021159	1
0.3333	0.142	0.13692	0.0050778	1
0.4166	0.091	0.090165	0.00083492	1
0.5	0.056	0.059345	-0.0033451	1
0.5833	0.034	0.03908	-0.0050795	1
0.6666	0.028	0.025734	0.0022656	1
0.75	0.015	0.016938	-0.0019379	1
0.8333	0.012	0.011154	0.00084615	1
0.9166	0.009	0.007345	0.001655	1

==========

RESULTS FROM VISUAL CURVE MATCHING

VISUAL MATCH PARAMETER ESTIMATES

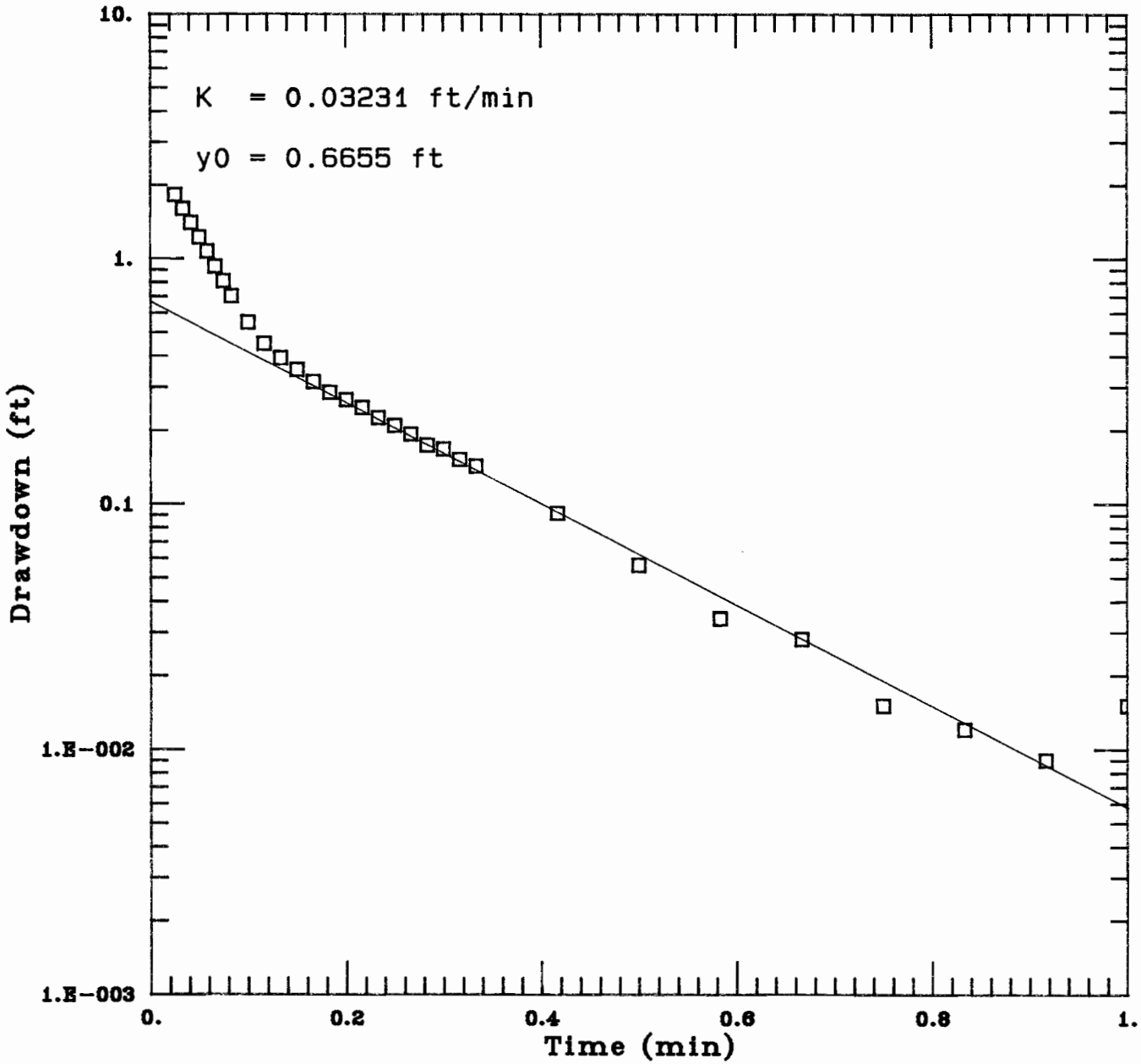
	Estimate
K =	3.4140E-002
y0 =	7.2851E-001

BOUWER-RICE SLUG TEST ANAL MW31 (test1)

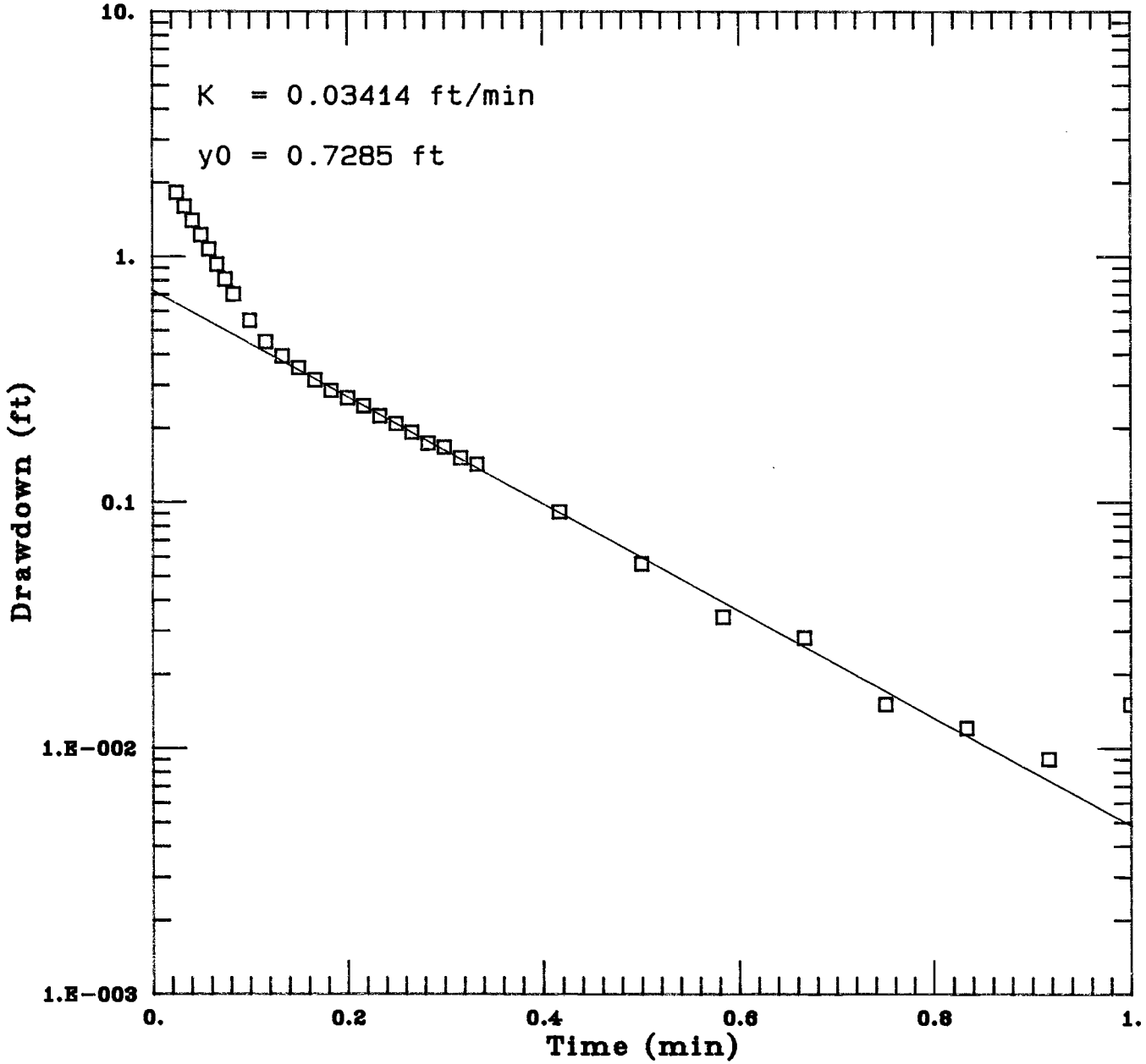
slugt1
1.815
0.268
0.417
slugt2
61.4
10
8.85
tsdata

0.025	1.815	0
0.0333	1.594	0
0.0416	1.395	0
0.05	1.217	0
0.0583	1.066	0
0.0666	0.926	0
0.075	0.806	0
0.0833	0.699	0
0.1	0.547	0
0.1166	0.449	0
0.1333	0.392	0
0.15	0.351	1
0.1666	0.313	1
0.1833	0.284	1
0.2	0.265	1
0.2166	0.246	1
0.2333	0.224	1
0.25	0.208	1
0.2666	0.192	1
0.2833	0.173	1
0.3	0.167	1
0.3166	0.151	1
0.3333	0.142	1
0.4166	0.091	1
0.5	0.056	1
0.5833	0.034	1
0.6666	0.028	1
0.75	0.015	1
0.8333	0.012	1
0.9166	0.009	1
1	0.015	0
1.0833	0.015	0
1.1666	0.006	0
1.25	0.009	0
1.3333	0.015	0
1.4166	0.006	0
1.5	0.006	0
1.5833	0.003	0

BOUWER-RICE SLUG TEST ANAL MW31 (test1)



BOUWER-RICE SLUG TEST ANAL MW31 (test1)



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03/17/91 13:34:33

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PROBLEM DEFINITION

Problem title: BOUWER-RICE SLUG TEST ANAL MW31 (test2)

Knowns and Constants:
- No. of data points.................. 38
- Radius of well casing............... 0.268
- Radius of well...................... 0.417
- Aquifer saturated thickness......... 61.4
- Well screen length.................. 10
- Static height of water in well...... 8.85
- Log(Re/Rw).......................... 1.896
- A, B, C............................. 2.262, 0.363, 0.000

===

ANALYTICAL METHOD

Bouwer and Rice (unconfined aquifer slug test)

===

RESULTS FROM STATISTICAL CURVE MATCHING

STATISTICAL MATCH PARAMETER ESTIMATES

	Estimate		Std. Error
K =	3.4846E-002	+/-	5.9100E-004
y0 =	7.5314E-001	+/-	1.2922E-002

ANALYSIS OF MODEL RESIDUALS

residual = calculated - observed
weighted residual = residual * weight

Weighted Residual Statistics:
- Number of residuals............... 21
- Number of estimated parameters.... 2
- Degrees of freedom................ 19
- Residual mean..................... 0.0005223
- Residual standard deviation....... 0.005904
- Residual variance................. 3.485E-005

Model Residuals:

Time	Observed	Calculated	Residual	Weight
0.1166	0.43	0.41463	0.015373	1

0.1333	0.382	0.38065	0.0013452	1
0.15	0.344	0.34947	-0.0054659	1
0.1666	0.316	0.321	-0.0049968	1
0.1833	0.287	0.2947	-0.007696	1
0.2	0.262	0.27055	-0.0085502	1
0.2166	0.246	0.24851	-0.0025099	1
0.2333	0.227	0.22815	-0.0011483	1
0.25	0.205	0.20946	-0.0044551	1
0.2666	0.189	0.19239	-0.0033919	1
0.2833	0.183	0.17663	0.0063717	1
0.3	0.167	0.16216	0.0048437	1
0.3166	0.151	0.14895	0.0020537	1
0.3333	0.142	0.13674	0.0052576	1
0.4166	0.098	0.089272	0.0087279	1
0.5	0.056	0.058251	-0.0022513	1
0.5833	0.037	0.038029	-0.0010293	1
0.6666	0.028	0.024827	0.0031726	1
0.75	0.018	0.0162	0.0017998	1
0.8333	0.012	0.010576	0.0014237	1
0.9166	0.009	0.0069047	0.0020953	1

==========

RESULTS FROM VISUAL CURVE MATCHING

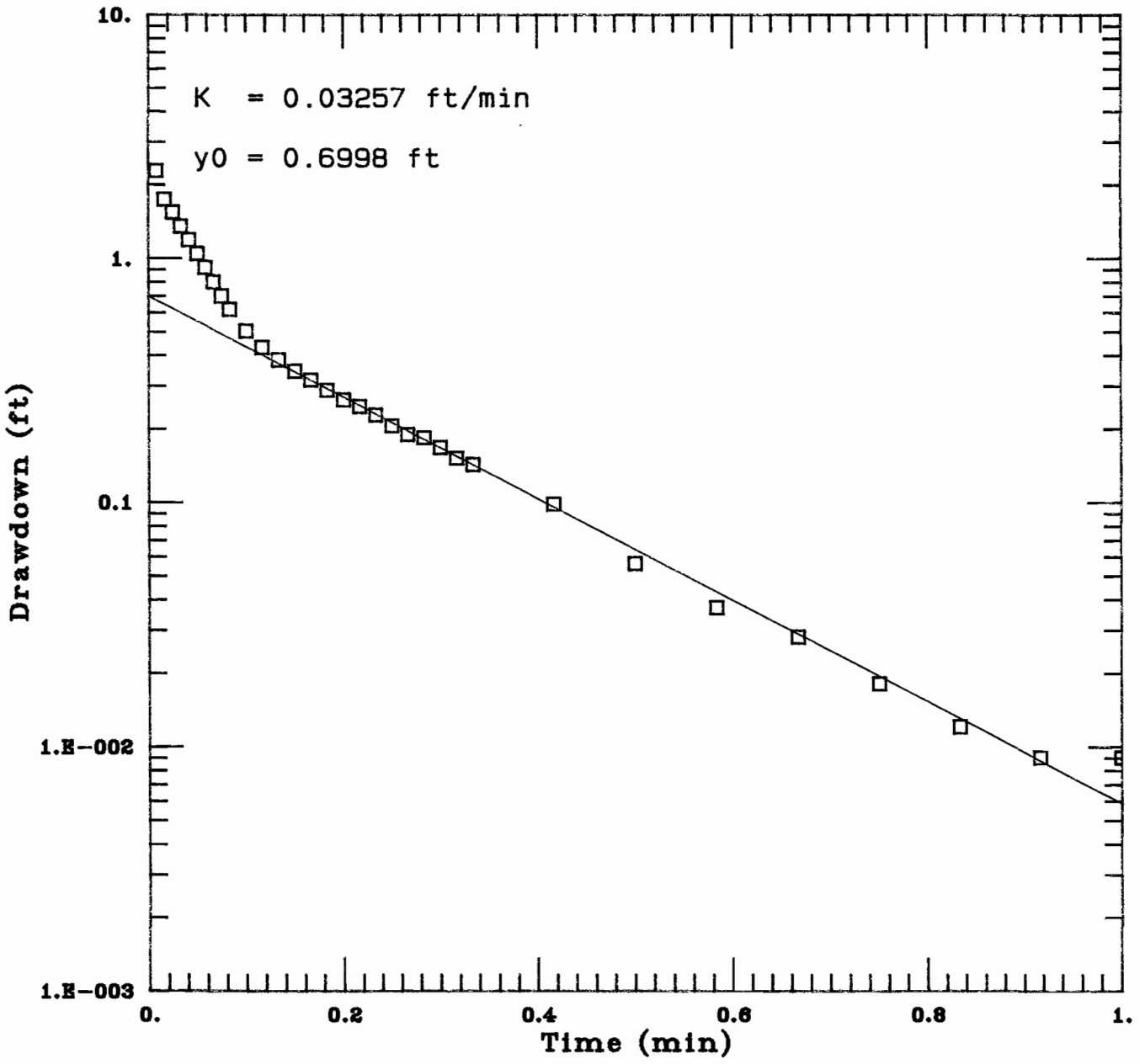
VISUAL MATCH PARAMETER ESTIMATES

	Estimate
K =	3.4846E-002
y0 =	7.5314E-001

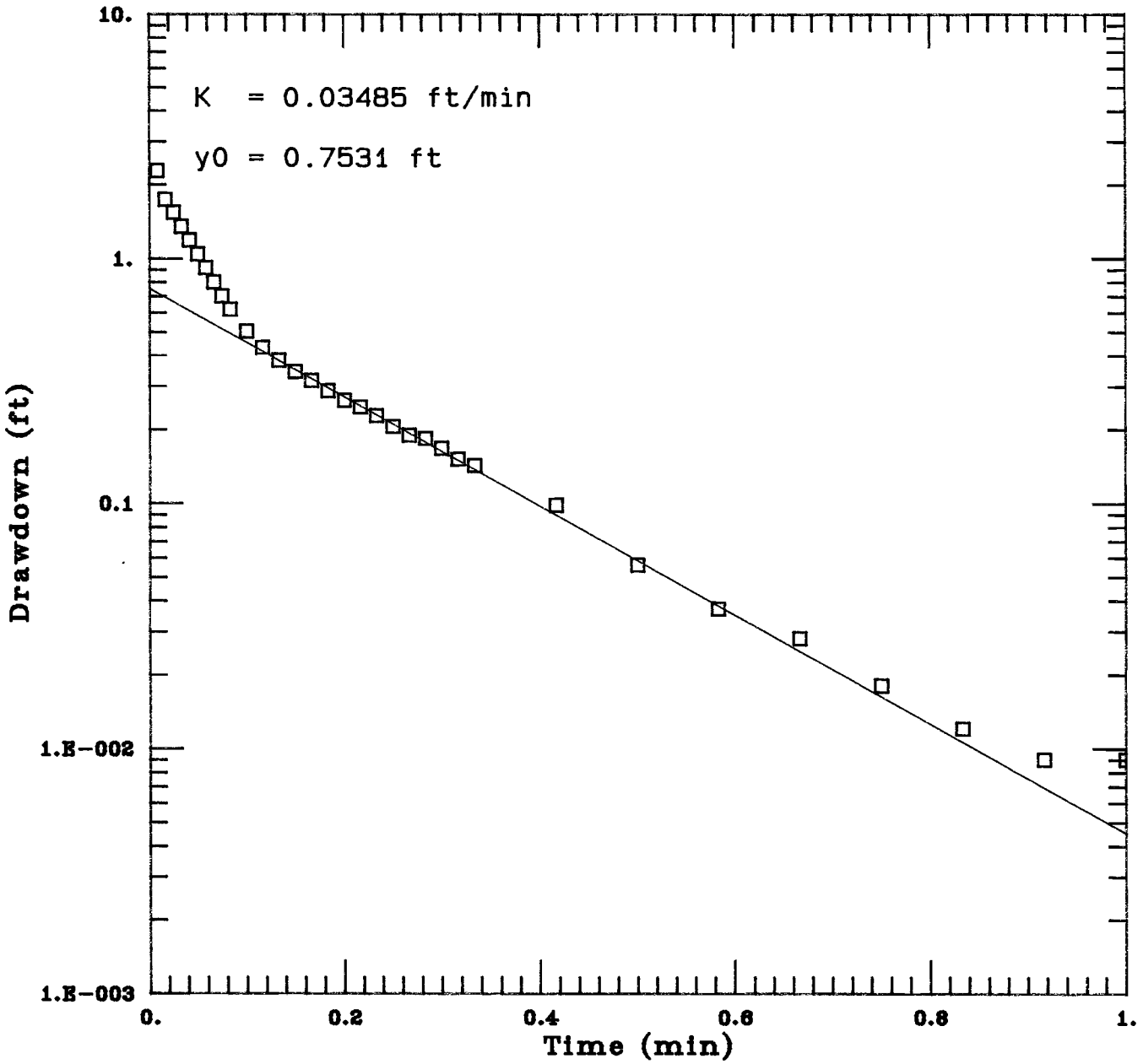
BOUWER-RICE SLUG TEST ANAL MW31 (test2)

```
slugt1
2.268
0.268
0.417
slugt2
61.4
10
8.85
tsdata
0.0083    2.268    0
0.0166    1.733    0
0.025    1.534    0
0.0333    1.344    0
0.0416    1.183    0
0.05    1.037    0
0.0583    0.911    0
0.0666    0.797    0
0.075    0.699    0
0.0833    0.616    0
0.1    0.502    0
0.1166    0.43    1
0.1333    0.382    1
0.15    0.344    1
0.1666    0.316    1
0.1833    0.287    1
0.2    0.262    1
0.2166    0.246    1
0.2333    0.227    1
0.25    0.205    1
0.2666    0.189    1
0.2833    0.183    1
0.3    0.167    1
0.3166    0.151    1
0.3333    0.142    1
0.4166    0.098    1
0.5    0.056    1
0.5833    0.037    1
0.6666    0.028    1
0.75    0.018    1
0.8333    0.012    1
0.9166    0.009    1
1    0.009    0
1.0833    0.006    0
1.1666    0.006    0
1.25    0.006    0
1.3333    0.006    0
1.4166    0.003    0
```

BOUWER-RICE SLUG TEST ANAL MW31 (test2)



BOUWER-RICE SLUG TEST ANAL MW31 (test2)



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03/17/91 13:49:22

PROBLEM DEFINITION

Problem title: BOUWER-RICE SLUG TEST ANAL MW32 (test1)

Knowns and Constants:
No. of data points.................. 53
Radius of well casing............... 0.268
Radius of well...................... 0.417
Aquifer saturated thickness......... 73.34
Well screen length.................. 10
Static height of water in well...... 8.91
Log(Re/Rw).......................... 1.887
A, B, C............................. 2.262, 0.363, 0.000

ANALYTICAL METHOD

Bouwer and Rice (unconfined aquifer slug test)

RESULTS FROM STATISTICAL CURVE MATCHING

STATISTICAL MATCH PARAMETER ESTIMATES

	Estimate		Std. Error
K =	2.6568E-003	+/-	1.4333E-005
y0 =	2.1423E+000	+/-	6.0880E-003

ANALYSIS OF MODEL RESIDUALS

residual = calculated - observed
weighted residual = residual * weight

Weighted Residual Statistics:
Number of residuals............... 19
Number of estimated parameters.... 2
Degrees of freedom................ 17
Residual mean..................... -0.0001445
Residual standard deviation....... 0.005534
Residual variance................. 3.062E-005

Model Residuals:

Time	Observed	Calculated	Residual	Weight
0.6666	1.644	1.6497	-0.0057	1

0.75	1.594	1.5966	-0.0026404	1
0.8333	1.543	1.5453	-0.002348	1
0.9166	1.493	1.4957	-0.0027033	1
1	1.448	1.4476	0.00040323	1
1.0833	1.404	1.4011	0.0029076	1
1.1666	1.357	1.3561	0.000918	1
1.25	1.315	1.3125	0.0025339	1
1.3333	1.271	1.2703	0.00069715	1
1.4166	1.23	1.2295	0.00050591	1
1.5	1.192	1.1899	0.0020503	1
1.5833	1.154	1.1517	0.0022777	1
1.6666	1.116	1.1147	0.0012771	1
1.75	1.081	1.0789	0.0021301	1
1.8333	1.05	1.0442	0.005789	1
1.9166	1.015	1.0107	0.0043345	1
2	0.983	0.97816	0.0048407	1
2.5	0.803	0.80406	-0.0010639	1
3	0.642	0.66095	-0.018954	1

==========

RESULTS FROM VISUAL CURVE MATCHING

VISUAL MATCH PARAMETER ESTIMATES

	Estimate
K =	2.6568E-003
y0 =	2.1423E+000

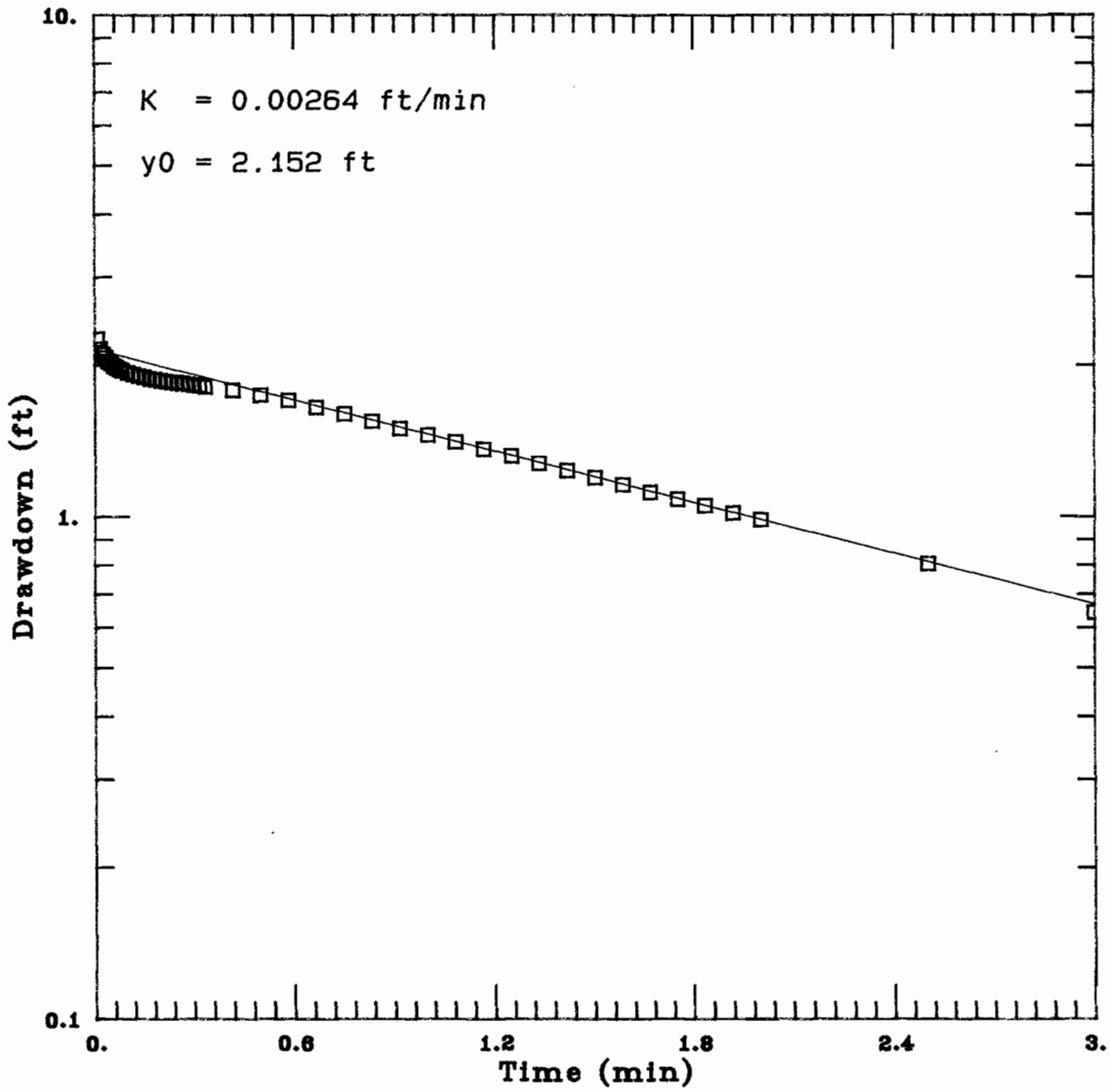
BOUWER-RICE SLUG TEST ANAL MW32 (test1)

slugt1
2.249
0.268
0.417
slugt2
73.34
10
8.91
tsdata

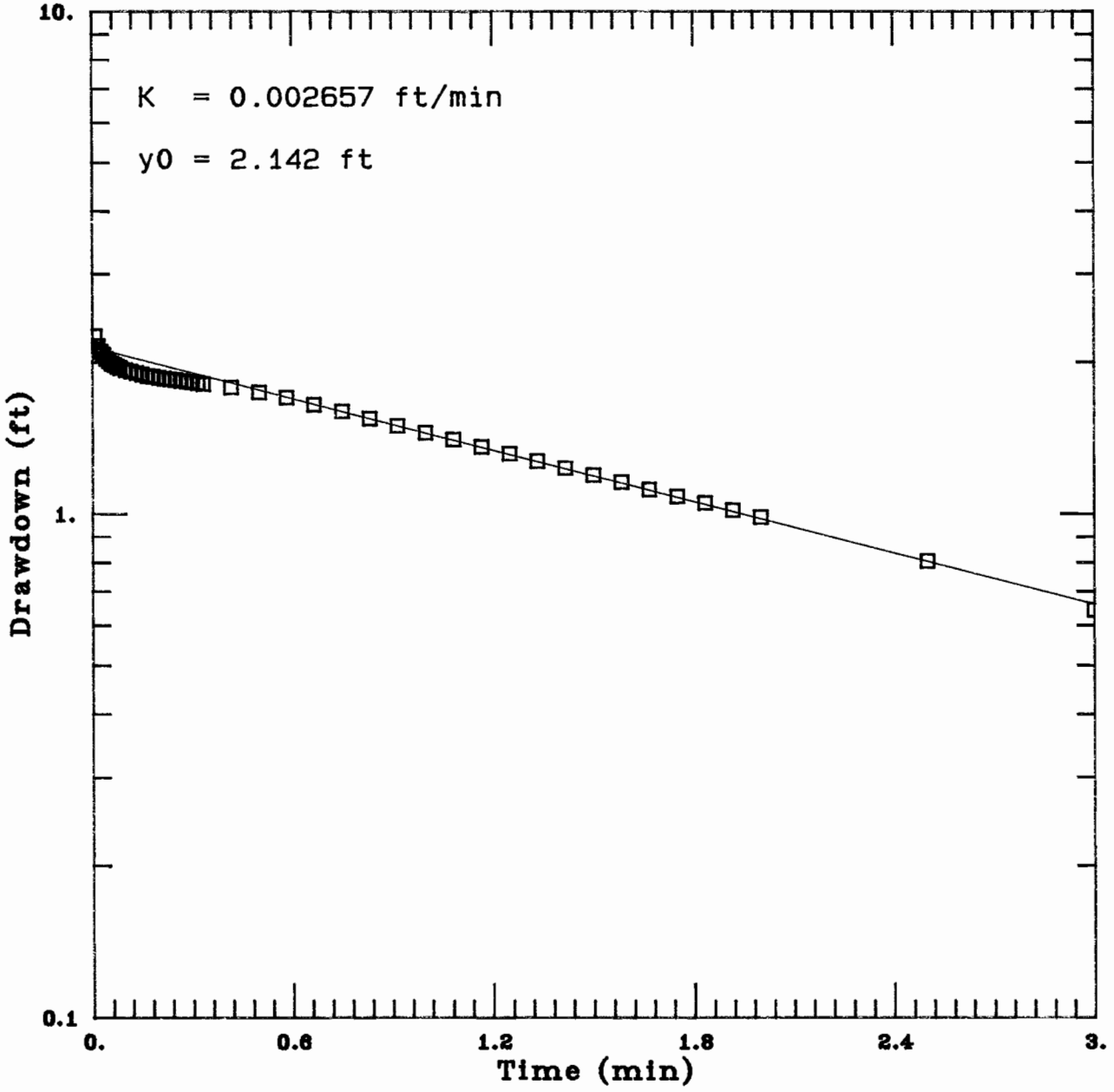
0.0083	2.249	0
0.0166	2.151	0
0.025	2.097	0
0.0333	2.068	0
0.0416	2.03	0
0.05	2.011	0
0.0583	1.986	0
0.0666	1.973	0
0.075	1.958	0
0.0833	1.945	0
0.1	1.926	0
0.1166	1.913	0
0.1333	1.901	0
0.15	1.888	0
0.1666	1.875	0
0.1833	1.869	0
0.2	1.86	0
0.2166	1.853	0
0.2333	1.847	0
0.25	1.841	0
0.2666	1.834	0
0.2833	1.828	0
0.3	1.822	0
0.3166	1.815	0
0.3333	1.806	0
0.4166	1.777	0
0.5	1.739	0
0.5833	1.698	0
0.6666	1.644	1
0.75	1.594	1
0.8333	1.543	1
0.9166	1.493	1
1	1.448	1
1.0833	1.404	1
1.1666	1.357	1
1.25	1.315	1
1.3333	1.271	1
1.4166	1.23	1
1.5	1.192	1
1.5833	1.154	1
1.6666	1.116	1
1.75	1.081	1
1.8333	1.05	1
1.9166	1.015	1
2	0.983	1
2.5	0.803	1
3	0.642	1
3.5	0.521	0
4	0.417	0
4.5	0.328	0

5	0.265	0
5.5	0.205	0
6	0.158	0

BOUWER-RICE SLUG TEST ANAL MW32 (test1)



BOUWER-RICE SLUG TEST ANAL MW32 (test1)



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03/17/91 14:34:19

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PROBLEM DEFINITION

Problem title: BOUWER-RICE SLUG TEST ANAL MW32 (test2)

Knowns and Constants:
   No. of data points.................. 62
   Radius of well casing............... 0.268
   Radius of well...................... 0.417
   Aquifer saturated thickness......... 73.34
   Well screen length.................. 10
   Static height of water in well...... 8.91
   Log(Re/Rw).......................... 1.887
   A, B, C............................. 2.262, 0.363, 0.000

==

ANALYTICAL METHOD

Bouwer and Rice (unconfined aquifer slug test)

==

RESULTS FROM STATISTICAL CURVE MATCHING

STATISTICAL MATCH PARAMETER ESTIMATES

	Estimate		Std. Error
K =	2.0453E-003	+/-	1.5681E-005
y0 =	1.9252E+000	+/-	3.2165E-003

ANALYSIS OF MODEL RESIDUALS

residual = calculated - observed
weighted residual = residual * weight

Weighted Residual Statistics:
   Number of residuals............... 43
   Number of estimated parameters.... 2
   Degrees of freedom................ 41
   Residual mean..................... -0.0001093
   Residual standard deviation....... 0.0132
   Residual variance................. 0.0001743

Model Residuals:

Time	Observed	Calculated	Residual	Weight
0.0333	1.935	1.9059	0.029092	1

0.0416	1.923	1.9011	0.02186	1
0.05	1.907	1.8963	0.010673	1
0.0583	1.894	1.8916	0.0024165	1
0.0666	1.885	1.8869	-0.0018517	1
0.075	1.872	1.8821	-0.010075	1
0.0833	1.866	1.8774	-0.011367	1
0.1	1.853	1.8679	-0.01493	1
0.1166	1.841	1.8586	-0.017596	1
0.1333	1.828	1.8493	-0.021253	1
0.15	1.822	1.84	-0.017957	1
0.1666	1.815	1.8308	-0.015763	1
0.1833	1.809	1.8216	-0.01256	1
0.2	1.799	1.8124	-0.013403	1
0.2166	1.793	1.8033	-0.010347	1
0.2333	1.784	1.7943	-0.010282	1
0.25	1.777	1.7853	-0.0082625	1
0.2666	1.771	1.7763	-0.0053419	1
0.2833	1.768	1.7674	0.00058748	1
0.3	1.761	1.7585	0.002472	1
0.3166	1.755	1.7497	0.005259	1
0.3333	1.749	1.7409	0.0080547	1
0.4166	1.717	1.6977	0.019272	1
0.5	1.676	1.6555	0.020466	1
0.5833	1.635	1.6144	0.020563	1
0.6666	1.597	1.5744	0.02264	1
0.75	1.55	1.5352	0.014768	1
0.8333	1.508	1.4971	0.010878	1
0.9166	1.47	1.46	0.010043	1
1	1.426	1.4237	0.0023275	1
1.0833	1.401	1.3883	0.012669	1
1.1666	1.36	1.3539	0.0061325	1
1.25	1.325	1.3202	0.0047806	1
1.3333	1.284	1.2874	-0.0034463	1
1.4166	1.252	1.2555	-0.0034868	1
1.5	1.227	1.2243	0.0027162	1
1.5833	1.192	1.1939	-0.0018923	1
1.6666	1.16	1.1643	-0.0042552	1
1.75	1.132	1.1353	-0.0033195	1
1.8333	1.1	1.1071	-0.0071364	1
1.9166	1.075	1.0797	-0.0046529	1
2	1.043	1.0528	-0.0098199	1
2.5	0.882	0.90537	-0.02337	1

==========

RESULTS FROM VISUAL CURVE MATCHING

VISUAL MATCH PARAMETER ESTIMATES

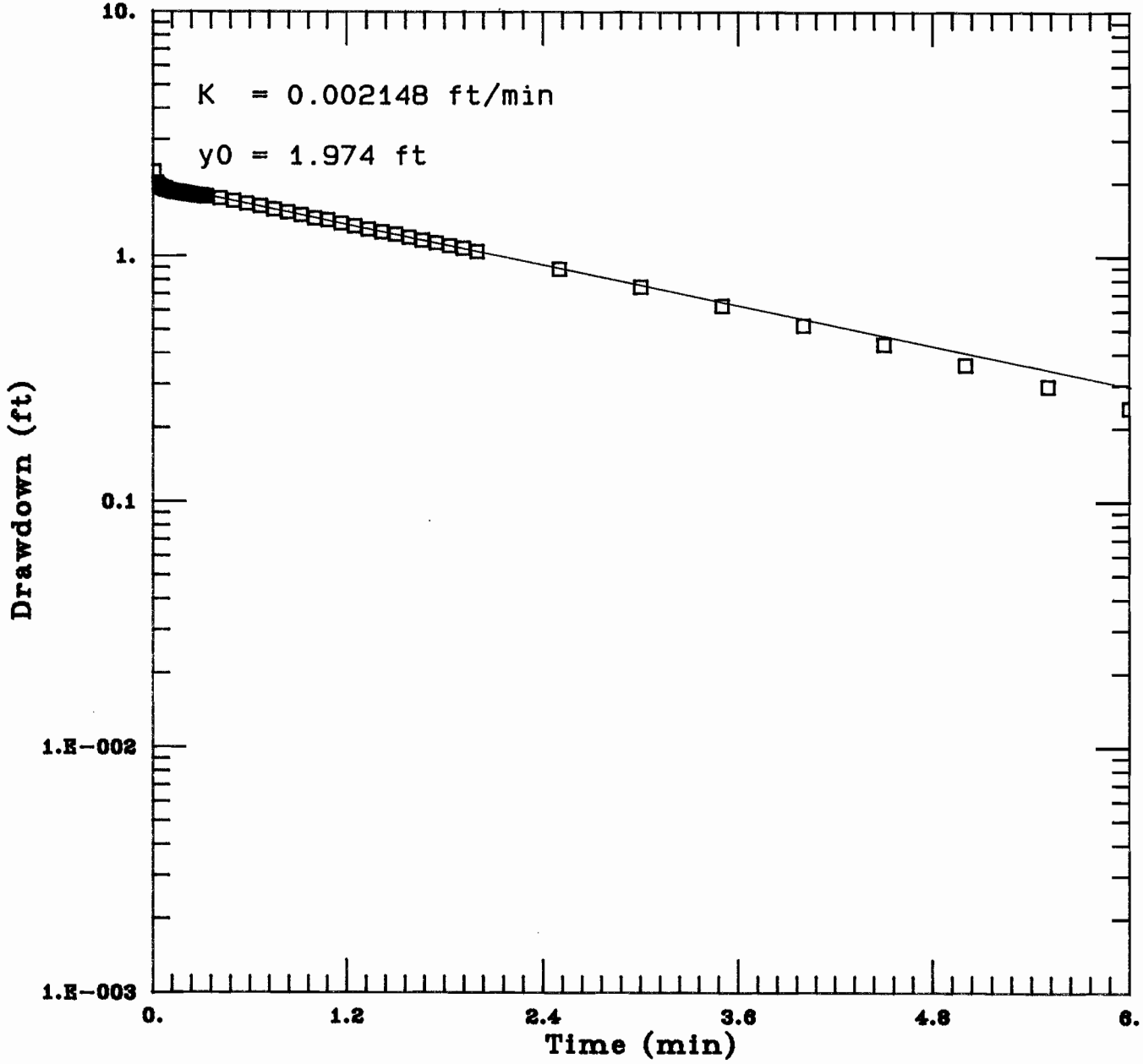
	Estimate
K =	2.0453E-003
y0 =	1.9252E+000

BOUWER-RICE SLUG TEST ANAL MW32 (test2)

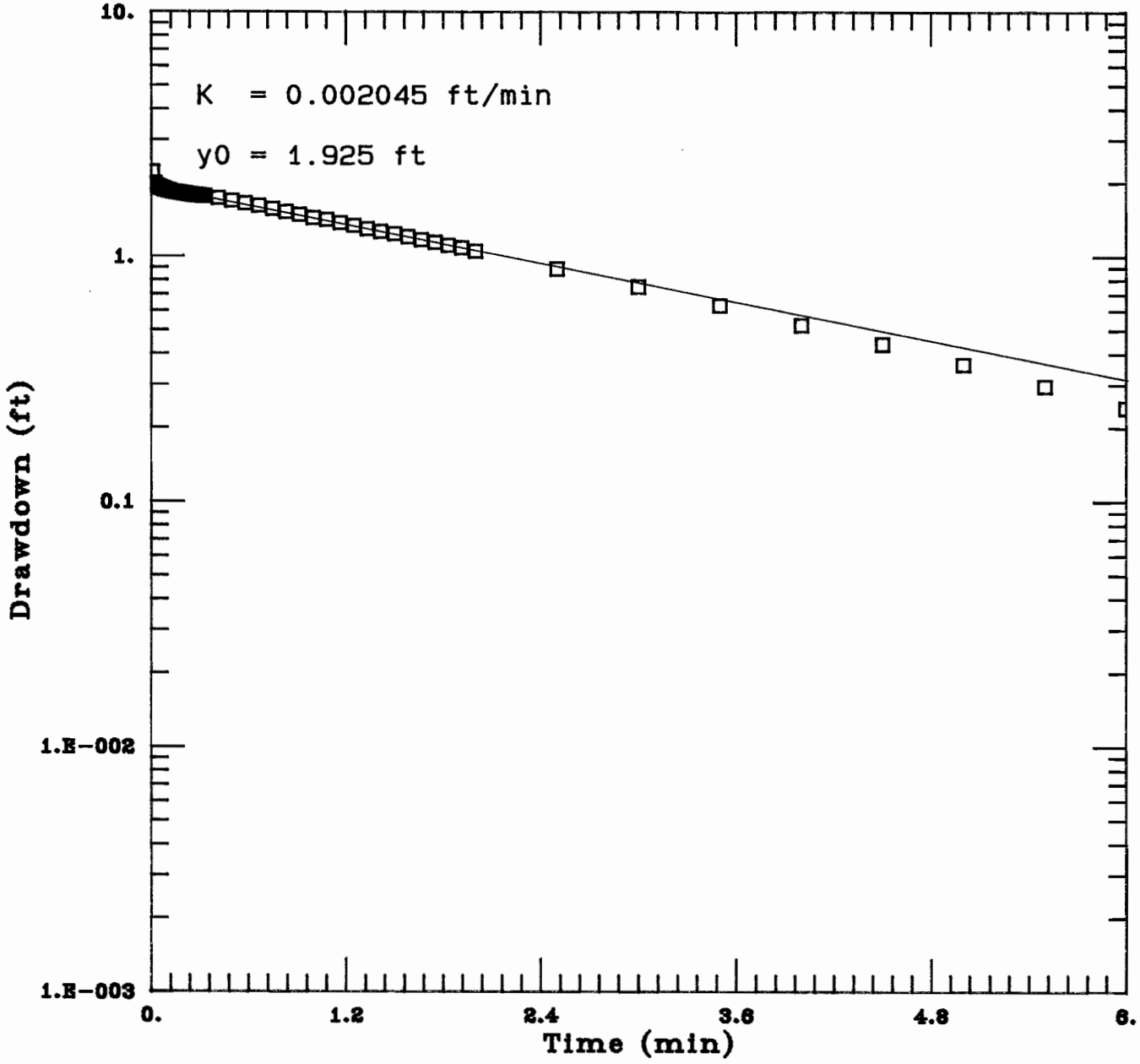
```
slugt1
2.201
0.268
0.417
slugt2
73.34
10
8.91
tsdata
0.0083    2.201    0
0.0166    1.98    0
0.025    1.98    0
0.0333    1.935    1
0.0416    1.923    1
0.05    1.907    1
0.0583    1.894    1
0.0666    1.885    1
0.075    1.872    1
0.0833    1.866    1
0.1    1.853    1
0.1166    1.841    1
0.1333    1.828    1
0.15    1.822    1
0.1666    1.815    1
0.1833    1.809    1
0.2    1.799    1
0.2166    1.793    1
0.2333    1.784    1
0.25    1.777    1
0.2666    1.771    1
0.2833    1.768    1
0.3    1.761    1
0.3166    1.755    1
0.3333    1.749    1
0.4166    1.717    1
0.5    1.676    1
0.5833    1.635    1
0.6666    1.597    1
0.75    1.55    1
0.8333    1.508    1
0.9166    1.47    1
1    1.426    1
1.0833    1.401    1
1.1666    1.36    1
1.25    1.325    1
1.3333    1.284    1
1.4166    1.252    1
1.5    1.227    1
1.5833    1.192    1
1.6666    1.16    1
1.75    1.132    1
1.8333    1.1    1
1.9166    1.075    1
2    1.043    1
2.5    0.882    1
3    0.746    0
3.5    0.626    0
4    0.521    0
4.5    0.436    0
```

5	0.36	0
5.5	0.294	0
6	0.24	0
6.5	0.192	0
7	0.151	0
7.5	0.12	0
8	0.094	0
8.5	0.072	0
9	0.053	0
9.5	0.044	0
10	0.028	0
11	0.009	0

BOUWER-RICE SLUG TEST ANAL MW32 (test2)



BOUWER-RICE SLUG TEST ANAL MW32 (test2)



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A Q T E S O L V   R E S U L T S

03/17/90 15:07:36

PROBLEM DEFINITION

Problem title: BOUWER-RICE SLUG TEST ANAL MW33 (test1)

Knowns and Constants:
- No. of data points.................. 33
- Radius of well casing............... 0.268
- Radius of well...................... 0.417
- Aquifer saturated thickness......... 67.29
- Well screen length.................. 10
- Static height of water in well...... 9.48
- Log(Re/Rw).......................... 1.919
- A, B, C............................. 2.262, 0.363, 0.000

ANALYTICAL METHOD

Bouwer and Rice (unconfined aquifer slug test)

RESULTS FROM STATISTICAL CURVE MATCHING

STATISTICAL MATCH PARAMETER ESTIMATES

	Estimate		Std. Error
K =	3.6645E-002	+/-	1.4615E-003
y0 =	3.6605E-001	+/-	2.3103E-002

ANALYSIS OF MODEL RESIDUALS

residual = calculated - observed
weighted residual = residual * weight

Weighted Residual Statistics:
- Number of residuals............... 10
- Number of estimated parameters.... 2
- Degrees of freedom................ 8
- Residual mean..................... 0.0001152
- Residual standard deviation....... 0.002309
- Residual variance................. 5.334E-006

Model Residuals:

Time	Observed	Calculated	Residual	Weight
0.25	0.101	0.096883	0.0041171	1

0.2666	0.088	0.088698	-0.00069811	1
0.2833	0.079	0.081162	-0.0021616	1
0.3	0.072	0.074266	-0.0022655	1
0.3166	0.066	0.067991	-0.0019915	1
0.3333	0.063	0.062214	0.00078558	1
0.4166	0.041	0.039952	0.0010483	1
0.5	0.028	0.025642	0.0023582	1
0.5833	0.015	0.016466	-0.0014662	1
0.6666	0.012	0.010574	0.0014261	1

==========

RESULTS FROM VISUAL CURVE MATCHING

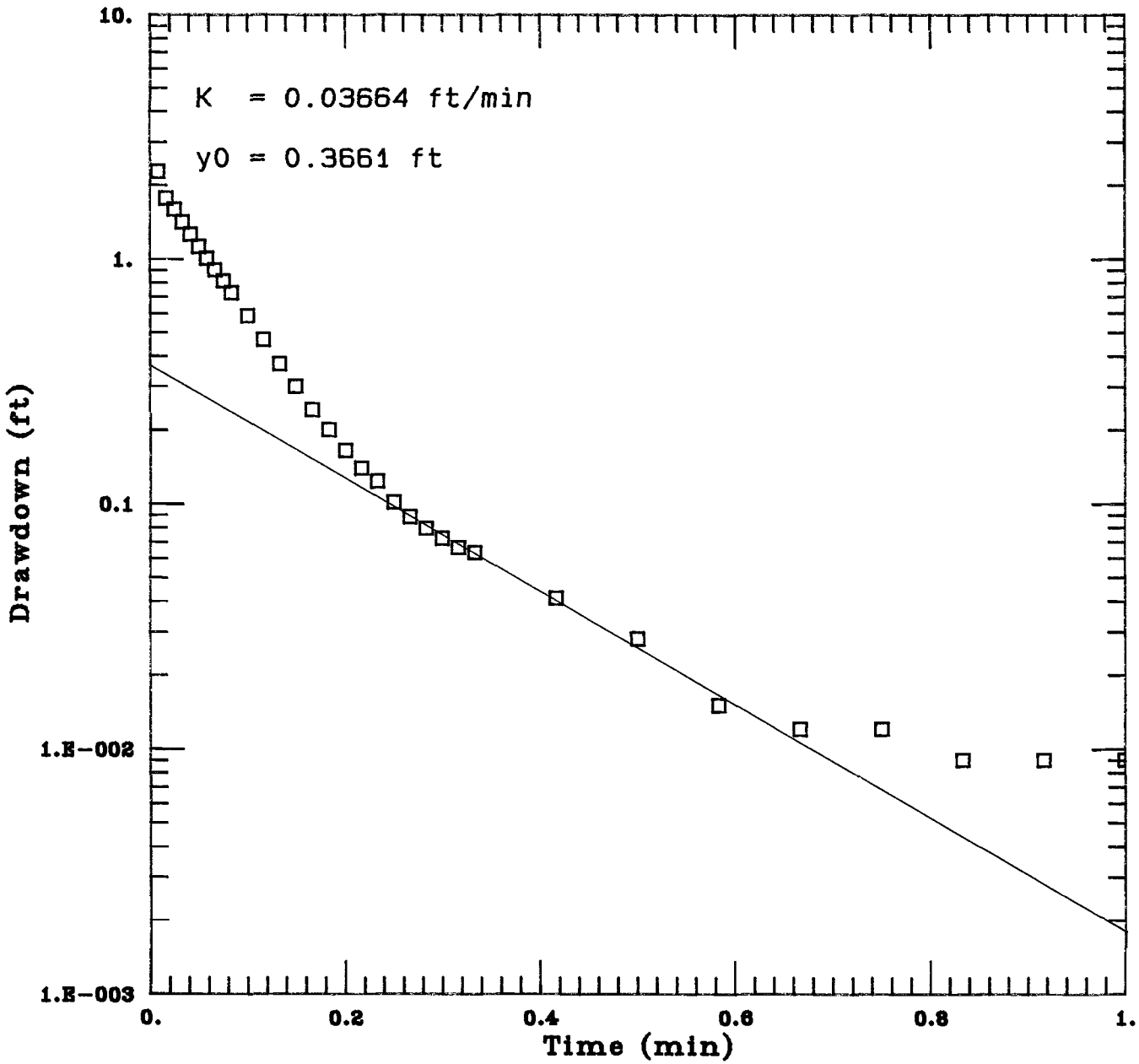
VISUAL MATCH PARAMETER ESTIMATES

	Estimate
K =	3.6645E-002
y0 =	3.6605E-001

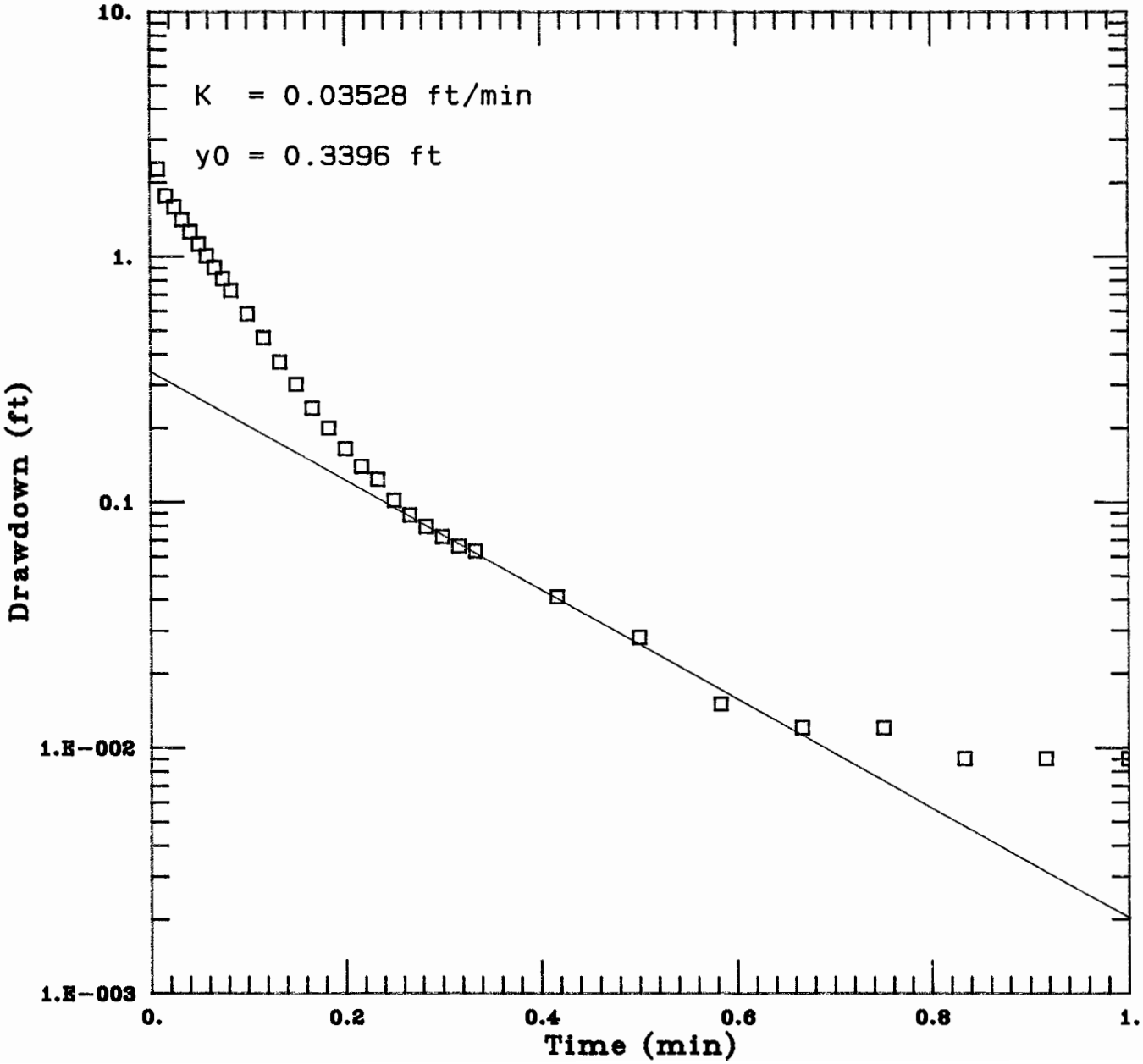
BOUWER-RICE SLUG TEST ANAL MW33 (test1)

```
slugt1
2.264
0.268
0.417
slugt2
67.29
10
9.48
tsdata
0.0083    2.264    0
0.0166    1.758    0
0.025    1.587    0
0.0333    1.407    0
0.0416    1.255    0
0.05    1.119    0
0.0583    1.002    0
0.0666    0.898    0
0.075    0.809    0
0.0833    0.724    0
0.1    0.582    0
0.1166    0.465    0
0.1333    0.37    0
0.15    0.3    0
0.1666    0.24    0
0.1833    0.199    0
0.2    0.164    0
0.2166    0.139    0
0.2333    0.123    0
0.25    0.101    1
0.2666    0.088    1
0.2833    0.079    1
0.3    0.072    1
0.3166    0.066    1
0.3333    0.063    1
0.4166    0.041    1
0.5    0.028    1
0.5833    0.015    1
0.6666    0.012    1
0.75    0.012    0
0.8333    0.009    0
0.9166    0.009    0
1    0.009    0
```

BOUWER-RICE SLUG TEST ANAL MW33 (test1)



BOUWER-RICE SLUG TEST ANAL MW33 (test1)



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A Q T E S O L V   R E S U L T S

03/17/90 15:09:54

===

PROBLEM DEFINITION

Problem title: BOUWER-RICE SLUG TEST ANAL MW33 (test2)

Knowns and Constants:
- No. of data points.................. 33
- Radius of well casing............... 0.268
- Radius of well...................... 0.417
- Aquifer saturated thickness......... 67.29
- Well screen length.................. 10
- Static height of water in well...... 9.48
- Log(Re/Rw).......................... 1.919
- A, B, C............................. 2.262, 0.363, 0.000

===

ANALYTICAL METHOD

Bouwer and Rice (unconfined aquifer slug test)

===

RESULTS FROM STATISTICAL CURVE MATCHING

STATISTICAL MATCH PARAMETER ESTIMATES

	Estimate		Std. Error
K =	3.9199E-002	+/-	2.0067E-003
y0 =	3.9958E-001	+/-	3.5668E-002

ANALYSIS OF MODEL RESIDUALS

residual = calculated - observed
weighted residual = residual * weight

Weighted Residual Statistics:
- Number of residuals............... 8
- Number of estimated parameters.... 2
- Degrees of freedom................ 6
- Residual mean..................... 0.0001075
- Residual standard deviation....... 0.002421
- Residual variance................. 5.861E-006

Model Residuals:

Time	Observed	Calculated	Residual	Weight
0.2666	0.088	0.087712	0.00028811	1

0.2833	0.079	0.079764	-0.00076399	1
0.3	0.072	0.072536	-0.00053628	1
0.3166	0.066	0.066001	-1.03E-006	1
0.3333	0.063	0.06002	0.0029796	1
0.4166	0.034	0.037371	-0.003371	1
0.5	0.022	0.023255	-0.0012554	1
0.5833	0.018	0.01448	0.0035203	1

==========

RESULTS FROM VISUAL CURVE MATCHING

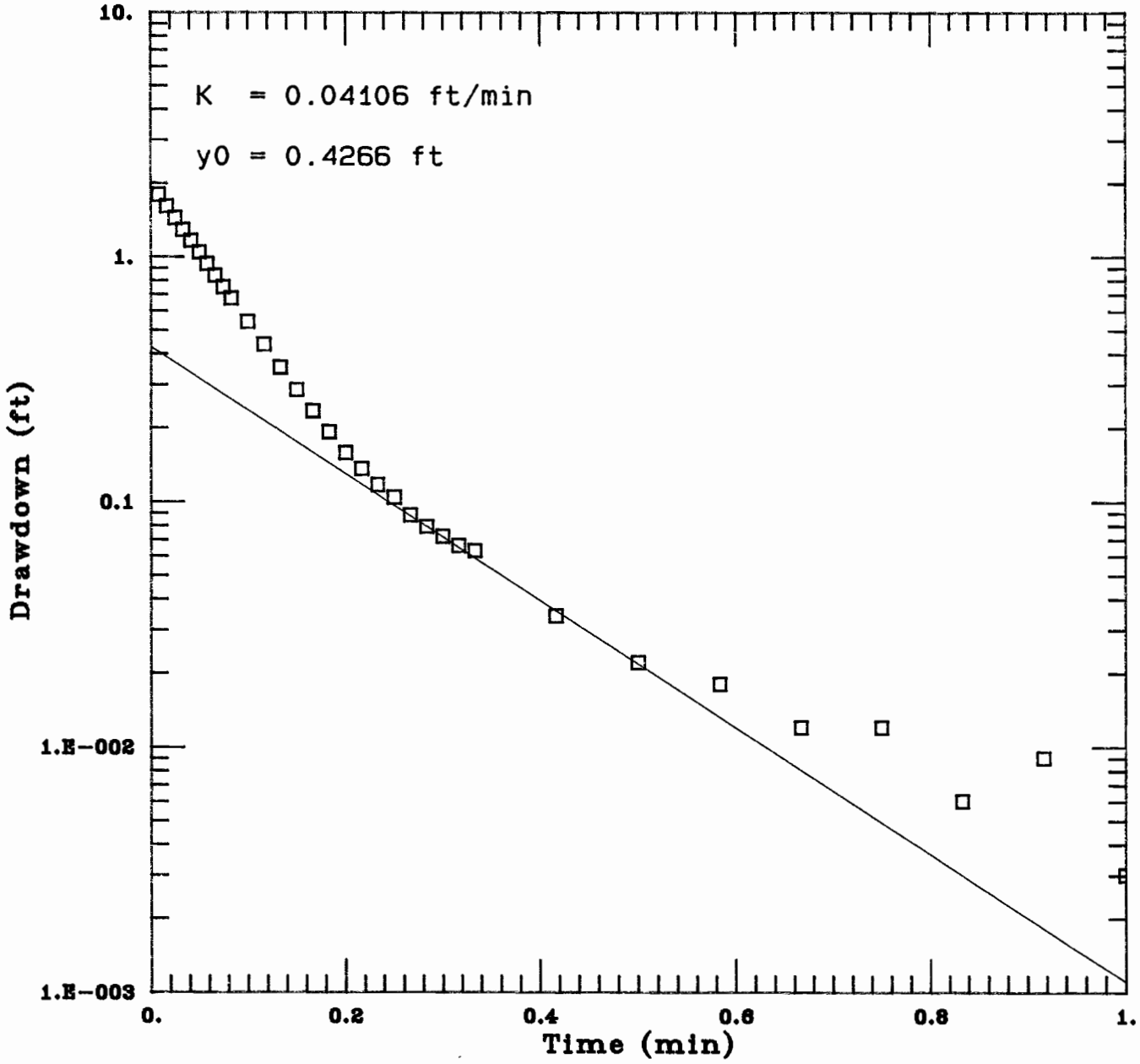
VISUAL MATCH PARAMETER ESTIMATES

	Estimate
K =	3.9199E-002
y0 =	3.9958E-001

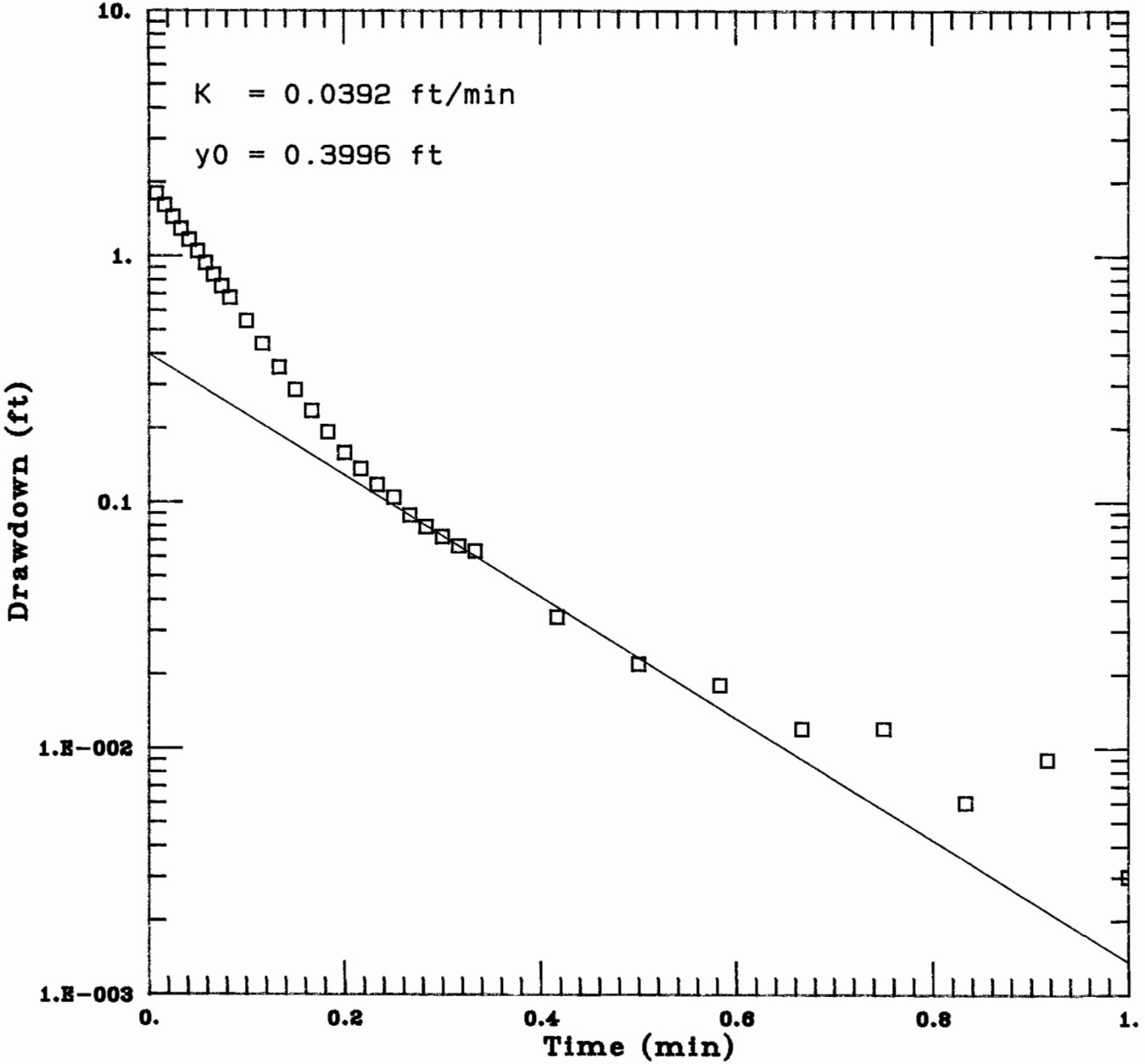
BOUWER-RICE SLUG TEST ANAL MW33 (test2)

```
slugt1
4.747
0.268
0.417
slugt2
67.29
10
9.48
tsdata
0.0083    1.79    0
0.0166    1.606    0
0.025    1.436    0
0.0333    1.284    0
0.0416    1.16    0
0.05    1.04    0
0.0583    0.933    0
0.0666    0.835    0
0.075    0.749    0
0.0833    0.673    0
0.1    0.54    0
0.1166    0.436    0
0.1333    0.351    0
0.15    0.284    0
0.1666    0.234    0
0.1833    0.192    0
0.2    0.158    0
0.2166    0.136    0
0.2333    0.117    0
0.25    0.104    0
0.2666    0.088    1
0.2833    0.079    1
0.3    0.072    1
0.3166    0.066    1
0.3333    0.063    1
0.4166    0.034    1
0.5    0.022    1
0.5833    0.018    1
0.6666    0.012    0
0.75    0.012    0
0.8333    0.006    0
0.9166    0.009    0
1    0.003    0
```

BOUWER-RICE SLUG TEST ANAL MW33 (test2)



BOUWER-RICE SLUG TEST ANAL MW33 (test2)



APPENDIX I

Data Usability Report

ENVIRONMENTAL CONSULTING & MANAGEMENT
ROUX ASSOCIATES INC

ROUX

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October 9, 1991

Mr. James Quinn
Environmental Engineer I
Bureau of Eastern Remedial Action
Division of Hazardous Waste Remediation
New York State Department of
Environmental Conservation
50 Wolf Road
Albany, New York 12233-7010

Re: AMTRAK - Sunnyside Yard (No. 241006)
Revised Data Usability Report

Dear Mr. Quinn:

Roux Associates, Inc. (Roux Associates) has prepared this revised data usability report, at the request of the New York State Department of Environmental Conservation (NYSDEC), for the Remedial Investigation (RI) at the Sunnyside Yard. This usability report has been developed from the data validation report prepared by Data Validation Services (Appendix F of the June 28, 1991 Roux Associates RI report entitled "Remedial Investigation, Sunnyside Yard, Queens, New York") in which the analytical data were evaluated and professional judgment was rendered on the acceptability (usability) of the results. The locations of the sampling points discussed below are shown on Plates 1 and 2.

Per your request dated September 6, 1991, a summary of the usability of these data (each sampling point) has been provided in Table 1.

Volatile Organic Compounds (VOCs)
There does not appear to be any incidences of noncompliancy in the analysis of the VOCs. Toluene values for four soil samples (S-22, S-80, S-82, S-90) were considered estimated due to surrogate and internal standards failure from matrix interference. However, these data may be used qualitatively.

The variation in the detection limits is due to the fact that the limits are reported on a wet-weight basis. If the results were corrected for sample percent solids the limit would be the same (i.e., less than 10 parts per billion [ppb]).

Semi-Volatile Organic Compounds (SVOCs)
Although these compounds do not appear to be constituents of concern for this site, noncompliancy was attributed to the following:

- exceeding the holding time;
- noncompliant surrogate recovery; and
- exceeding the 12-hour time frame for instrument recovery.

Holding times were exceeded when re-extraction was performed due to low surrogate recoveries. However, the holding times did not exceed 10 days (the previous holding time for soils). Although these results may be biased low, the difference in time (i.e., 5 to 7 days) should not render the data unusable. The data obtained from the re-extraction are considered estimated.

Ground-water sample MW-26 produced no recovery during the initial extraction, and re-extraction was not performed until 29 days after sample receipt. The exceeded holding time combined with inconsistent surrogate recoveries makes these data unusable.

Surrogate recoveries were outside of the acceptable range for several samples. In most cases the outliers are within five percentage points of the acceptable range, therefore the associated results are considered estimated. The estimated values can be used to define the area and extent of the contamination.

There were no acid recoveries for ground-water samples MW-23 and MW-29, therefore the acid compounds may not have been detected. These compounds do not appear to be constituents of concern based on the other monitoring well results, however MW-23 will be resampled for SVOCs in ground water.

The exceedance of the 12-hour time frame for instrument recovery occurred in only one sample. The sample results were not affected.

Polychlorinated Biphenyl (PCB) Data
As stated in the data validation report, the following quality control criteria were noncompliant:

- system linearity, degradation, retention time and calibration factor consistency criteria were not monitored, and were not within the limits of sample processing;
- no confirmation was performed on method blanks;
- standards were not run according to protocol for the aqueous samples;

- extracts were not analyzed within 5 days; and
- method blank contamination existed.

The majority of the sample results are flagged estimated. Sample results associated with the contaminated method blank are considered unusable.

The quality control violations, and insufficient documentation, do not allow quantitative use of these results. Although the data are qualified as estimated, the results are considered questionable. Roux Associates proposes to use this data, in conjunction with the existing data from previous studies, as a screening tool. The comparison with these studies is presented below. Confirmation sampling will be performed so that these data may be used in the Feasibility Study.

The PCB soil data in Area 1 have been compared to the existing data (Geraghty & Miller, 1985; Atlantic Environmental, 1985) in Plate 5. These previous sampling results correspond well with the results obtained by Roux Associates. The existing data will supplement Roux Associates' data to define the area and extent of contamination.

Existing soil data corresponding to the other Areas of Concern and facility-wide locations are presented in the National Railroad Passenger Corporation letter report (1983). The locations of sampling were not clearly defined, however there are only three locations where the PCB concentrations exceed 50 parts per million (ppm). These areas include the Boiler House Spoils (Area 4), under Honeywell Avenue near the YMCA (Area 5) and the 68 Spur Spoils Pile (Area 17). Although the concentrations from the 1983 results are significantly higher, the piles from which these samples were taken have been removed.

Although the Roux Associates' sampling results are estimated due to various compliancy deviations, the similarity with the existing data supports the use of these results as a screening tool. It should also be noted that even with a 10 percent variation, the data will remain under 50 ppm with few exceptions. Additional sampling has been proposed for soil and ground water. The location and number of samples are presented in Table 1.

Metals

General noncompliance in the metals analysis include:

- failure to repeat method blanks;
- post digestion spikes out of range;
- matrix spike recoveries outside limits; and
- exceeding the holding times for mercury.

In addition, there was contamination of the field and trip blanks for the aqueous samples.

Method blanks should have been repeated for selenium, however selenium is not a constituent of concern at the site. The reported result for ground-water sample MW-33 is considered unusable.

No post digestion spikes were performed for antimony, arsenic, chromium, lead, silver or thallium for soil samples S-60 (4-6) and S-33 (4-6). Although these sample results are considered estimated, they are in general agreement with samples taken in the surrounding area. One soil boring sample will be taken adjacent to S-60 to confirm these results.

Matrix spike recoveries for aqueous samples were outside of the limits for aluminum, selenium, lead, thallium, and manganese. Results for lead and thallium are biased high, while aluminum, selenium and manganese bias the results low. These results should be considered usable.

Holding times for mercury were exceeded in three soil samples (S-43, S-41A, S-53). All of the results for mercury in these compounds were below the detection limit. To confirm the reliability of this data, a soil sample will be taken adjacent to S-43.

Lead and chromium contamination were present in the field and trip blanks for the aqueous samples taken on January 4, 1991 and January 8, 1991. The functional guidelines for evaluating inorganics states that "Action levels should be calculated that are 5 times the maximum concentration of each contaminant detected in any blank. No positive sample results should be reported unless the concentration of the analyte in the sample exceeds 5 times the amount detected in any blank." Because most of the sample results are less than 5 times the amount found in the blank, confirmation sampling in MW-1, MW-29 and MW-25 has been proposed.

Total Petroleum Hydrocarbons (PHC)

The majority of PHC soil sampling locations were biased to known or suspected petroleum source areas. Consequently, the results reflect soil quality at locations where surficial petroleum impacts were clearly evident (spillage, staining).

Because of the inconsistencies in the analytical procedures (holding times, system linearity, blank contamination), the values presented may be considered as qualitative indicators of potentially impacted areas. For the most part the results are considered biased low, except where system linearity is reasonable, the method blank was zero, and the sample was diluted. These sample results are considered biased high.

In samples with several protocol deviations, the results may be considered usable for screening purposes when used in conjunction with existing data or photoionization detector readings.

Pesticides
As stated in the validation report, the noncompliant factors do not affect detection limit values. However, the presence of 4,4-DDT and 4,4-DDE is indistinguishable from Aroclor on the gas chromatography (GC) columns. These values were below the detection limits and may be used as qualitative. Pesticides do not appear to be constituents of concern as there is only one detection present.

Summary
The VOC data were generally supported by the raw data and were generally generated in compliance with the protocol.

The SVOC data were, with some exceptions, supported by the raw data and generated in compliance with the protocol. Ground-water sample MW-29 will be resampled to confirm the validity of the results received where holding times and the recovery of acid surrogates varied from the protocol.

Metals analyses were generally performed according to the required methodology. However, the contamination of the trip and field blanks associated with the aqueous samples has made those results questionable. For this reason it is proposed that 30 percent of the shallow wells be resampled for verification.

Although the pesticide data were not performed according to the protocol requirements, detection limits were not affected. The limited number of positive samples are considered estimated due to compliancy deviations.

PCB analyses were neither performed, nor documented, according to protocol requirements. These analyses may be used to screen for impacted areas as discussed earlier in this letter. Confirmation samples are proposed in the following section.

PHC data had blank and method limitations. These data are acceptable for the purpose of screening for future sampling.

Recommendations
Supplemental RI sampling has been proposed in the RI report (Table 2). In addition, the confirmation sampling described below (and listed in Table 2) is proposed. The locations of the proposed samples are shown in Plates 3 and 4.

- PCB-soil samples in areas where previous sampling exhibited high concentrations (Areas 4, 5, 17), areas adjacent to unusable results (S-67, S-68, S-60, S-1), and in areas where high concentrations are expected (Plates 3 and 4);

- PCB-ground-water samples in MW-1, MW-23, and MW-27;

- Metals-ground-water samples in MW-1, MW-25, and MW-29; and
- SVOCs-ground-water sample in MW-23.

The confirmatory results will be used in conjunction with the existing results (where there is good correlation), and the results from the sampling proposed in the RI, to define the nature and extent of contamination. These data will be the basis of the Feasibility Study.

Should you have any comments or questions, please do not hesitate to call.

Very truly yours,

ROUX ASSOCIATES, INC.

Michael A. DeCillis
Quality Assurance Officer

Paul H. Roux
President

cc: Robert Noonan, AMTRAK
Charles Lin, AMTRAK
Jared Roberts, Esq., AMTRAK
A.E. Fazio, P.E., AMTRAK
Charles Warren, Esq., Berle, Kass & Case
Glenn W. Ridsdale, P.E., New Jersey Transit

Table 1. Summary of Data Usability, Sunnyside Yard, Queens, NY

Rec Date	Sample ID	Matrix	VOA	BNA	Pest/ PCB	PCB Only	Metals	PHC
10/3/90	S-85	Soil	NR	NR	NR	NR	NR	JL
10/3/90	S-86	Soil	NR	NR	NR	NR	NR	JL
10/3/90	S-87	Soil	NR	NR	NR	NR	NR	JL
10/3/90	S-88	Soil	NR	NR	NR	NR	NR	JL
10/3/90	S-89	Soil	NR	NR	NR	NR	NR	JL
10/3/90	S-90	Soil	A1	JL	S	NR	JL	JL
10/3/90	S-91	Soil	NR	NR	NR	NR	NR	JL
10/3/90	S-92	Soil	NR	NR	NR	NR	NR	JL
10/3/90	S-27	Soil	NR	NR	NR	NR	NR	JL
10/5/90	S-29 0-2	Soil	NR	NR	NR	NR	NR	JH
10/5/90	S-79 0-2	Soil	NR	NR	NR	NR	NR	JH
10/5/90	S-80 0-2	Soil	NR	NR	NR	NR	NR	JL
10/5/90	S-80 2-4	Soil	A1	A	S	NR	A	NR
10/5/90	MW-32 0-2	Soil	NR	NR	NR	NR	NR	JL
10/5/90	S-71 0-2	Soil	NR	NR	NR	NR	NR	JH
10/5/90	S-71 6-8	Soil	NR	NR	NR	NR	NR	JL
10/5/90	S-70 0-2	Soil	NR	NR	NR	NR	NR	JL
10/5/90	S-70 6-8	Soil	NR	NR	NR	NR	NR	JL
10/5/90	S-72 0-2	Soil	NR	NR	NR	NR	NR	JL
10/5/90	S-72 6-8	Soil	NR	NR	NR	NR	NR	JL
10/5/90	S-73 0-2	Soil	NR	NR	NR	NR	NR	JH
10/6/90	S-21 0-2	Soil	NR	NR	NR	NR	NR	JL
10/6/90	S-21 6-8	Soil	NR	NR	NR	NR	NR	JL
10/6/90	S-23 0-2	Soil	NR	NR	NR	NR	NR	JL
10/6/90	S-23 8-10	Soil	NR	NR	NR	NR	NR	JL
10/10/90	S-24 0-2	Soil	NR	NR	NR	NR	NR	JL
10/10/90	S-24 9-11	Soil	NR	NR	NR	NR	NR	JL
10/10/90	S-74 0-2	Soil	NR	NR	NR	S	NR	JL
10/10/90	S-74 6-8	Soil	NR	NR	NR	NR	NR	JL
10/10/90	S-74 12-14	Soil	NR	NR	NR	NR	NR	JL
10/10/90	S-77 0-2	Soil	NR	NR	NR	S	NR	JL
10/10/90	S-77 13-15	Soil	NR	NR	NR	NR	NR	JL
10/10/90	S-75 0-2	Soil	NR	NR	NR	S	NR	JL
10/10/90	S-81 0-2	Soil	NR	NR	NR	NR	NR	JL
10/10/90	S-28 0-2	Soil	NR	NR	NR	NR	NR	JL

Table 1. Summary of Data Usability, Sunnyside Yard, Queens, NY

Rec Date	Sample ID	Matrix	VOA	BNA	Pest/ PCB	PCB Only	Metals	PHC
10/12/90	S-3 0-2	Soil	NR	NR	NR	S	NR	S
10/12/90	S-4 0-2	Soil	NR	NR	NR	S	NR	S
10/12/90	S-9 0-2	Soil	NR	NR	NR	S	NR	S
10/12/90	S-66 0-2	Soil	NR	NR	NR	NR	NR	S
10/12/90	S-69 0-2	Soil	NR	NR	NR	NR	NR	S
10/12/90	S-3 3-5	Soil	NR	NR	NR	S	NR	NR
10/12/90	S-9 3-4.5	Soil	NR	NR	NR	S	NR	NR
10/12/90	S-66 3-5	Soil	NR	NR	NR	S	NR	NR
10/16/90	S-54 0-2	Soil	NR	NR	NR	NR	NR	JL
10/16/90	S-54 7-9	Soil	NR	NR	NR	NR	NR	JL
10/16/90	S-55 0-2	Soil	NR	NR	NR	NR	NR	JL
10/16/90	S-55 7-9	Soil	NR	NR	NR	NR	NR	JL
10/16/90	S-56 0-2	Soil	NR	NR	NR	NR	NR	JL
10/16/90	S-56 7-9	Soil	NR	NR	NR	NR	NR	JL
10/18/90	S-82 0-2	Soil	A1	JL	NR	NR	A	S
10/18/90	S-82 6-8	Soil	NR	NR	NR	NR	NR	S
10/18/90	S-30 0-2	Soil	A	JL	S	NR	A	S
10/18/90	S-46 4-6	Soil	NR	NR	NR	NR	NR	S
10/18/90	S-10 0-2	Soil	NR	NR	NR	S	A	S
10/18/90	S-59 0-2	Soil	NR	NR	NR	S	NR	S
10/18/90	S-58 0-2	Soil	NR	NR	NR	NR	NR	S
10/18/90	S-40 0-2	Soil	NR	NR	NR	NR	NR	S
10/18/90	S-22 0-2	Soil	A1	JL	NR	NR	A	JL
10/18/90	S-31 0-2	Soil	NR	NR	NR	S	NR	JL
10/18/90	S-84 0-2	Soil	NR	NR	NR	U	NR	JL
10/18/90	S-83 0-2	Soil	NR	NR	NR	S	NR	S
10/19/90	S-94 0-2	Soil	NR	NR	NR	NR	NR	JL
10/19/90	S-94 2-3	Soil	NR	NR	NR	S	NR	NR
10/19/90	S-93 0-2	Soil	NR	NR	NR	NR	NR	JL
10/19/90	S-93 18-20	Soil	NR	NR	NR	NR	NR	JL
10/19/90	S-25 0-2	Soil	NR	NR	NR	NR	NR	ND
10/19/90	S-95 0-2	Soil	NR	NR	NR	NR	NR	JL
10/19/90	S-64 0-2	Soil	NR	NR	NR	NR	NR	JL
10/19/90	S-64 2-3	Soil	A	A	S	NR	A	NR

Table 1. Summary of Data Usability, Sunnyside Yard, Queens, NY

Rec Date	Sample ID	Matrix	VOA	BNA	Pest/ PCB	PCB Only	Metals	PHC
10/20/90	S-17 0-2	Soil	A	JL	S	NR	A	JL
10/20/90	S-49 0-2	Soil	NR	NR	NR	NR	NR	JL
10/20/90	S-49 2-4	Soil	A	JL	S	NR	A	JL
10/20/90	S-49 4-6	Soil	NR	NR	NR	NR	NR	JL
10/20/90	S-49 8-10	Soil	NR	NR	NR	NR	NR	JL
10/20/90	S-48 0-2	Soil	NR	NR	NR	NR	NR	JL
10/20/90	S-48 2-4	Soil	NR	NR	NR	NR	NR	JL
10/20/90	S-48 11-13	Soil	NR	NR	NR	NR	NR	JL
10/20/90	S-47 0-2	Soil	NR	NR	NR	NR	NR	JL
10/20/90	S-47 2-4	Soil	A	JL	S	NR	A	NR
10/20/90	S-47 7-9	Soil	NR	NR	NR	NR	NR	JL
10/20/90	S-47 11-13	Soil	NR	NR	NR	NR	NR	JL
10/22/90	MW-22 0-2	Soil	NR	NR	NR	S	NR	JL
10/22/90	MW-13 0-2	Soil	NR	NR	NR	S	NR	JL
10/26/90	S-2 0-2	Soil	NR	NR	NR	S	A	JL
10/26/90	S-65 0-2	Soil	NR	NR	NR	NR	NR	JL
10/26/90	S-62 0-2	Soil	A	A	S	NR	A	JL
10/26/90	S-61 0-1.1	Soil	NR	NR	NR	NR	NR	JL
10/26/90	S-61 5-7	Soil	A	A	S	NR	A	JL
10/26/90	S-63 0-2	Soil	NR	NR	NR	S	NR	JL
10/26/90	S-7 0-2	Soil	NR	NR	NR	S	NR	JL
10/26/90	S-8 0-2	Soil	NR	NR	NR	S	NR	JL
10/26/90	S-76 0-0.7	Soil	NR	NR	NR	S	NR	JL
10/29/90	S-67 0-2	Soil	NR	NR	NR	U	NR	S
10/29/90	S-68 0-2	Soil	NR	NR	NR	U	NR	S
10/29/90	S-45 0-2	Soil	NR	NR	NR	NR	NR	S
10/29/90	S-45 2-4	Soil	NR	NR	NR	NR	NR	S
10/29/90	S-1 0-2	Soil	NR	NR	NR	U	NR	S
10/29/90	S-1 2-3	Soil	NR	NR	NR	U	NR	S
10/29/90	MW-17 0-2	Soil	NR	NR	NR	U	NR	S
10/29/90	S-5 0-2	Soil	NR	NR	NR	S	NR	S
11/7/90	S-44 0-2	Soil	NR	NR	NR	NR	NR	S
11/7/90	S-44 4-6	Soil	NR	NR	NR	NR	NR	S
11/7/90	S-43 0-2	Soil	A	A	S	NR	A2	S
11/7/90	S-41 0-2	Soil	NR	NR	NR	NR	NR	S
11/7/90	S-42 0-2	Soil	NR	NR	NR	NR	NR	JL

Table 1. Summary of Data Usability, Sunnyside Yard, Queens, NY

Rec Date	Sample ID	Matrix	VOA	BNA	Pest/ PCB	PCB Only	Metals	PHC
11/7/90	S-41 2-4	Soil	NR	NR	NR	NR	NR	JL
11/9/90	MW-31 0-2	Soil	NR	NR	NR	S	A	JL
11/9/90	MW-31 10-12	Soil	NR	NR	NR	NR	NR	JL
11/9/90	MW-16 0-2	Soil	NR	NR	NR	S	NR	JL
11/9/90	MW-16 6-8	Soil	NR	NR	NR	NR	NR	NR
11/9/90	MW-16 10-12	Soil	NR	NR	NR	S	NR	NR
11/9/90	S-41A 3-5	Soil	A	A	S	NR	A2	NR
11/9/90	S-46 0-2	Soil	NR	NR	NR	NR	NR	JL
11/9/90	S-46 7-9	Soil	NR	NR	NR	NR	NR	JL
11/10/90	MW-28 0-2	Soil	NR	NR	NR	NR	NR	JL
11/10/90	MW-28 6-8	Soil	NR	NR	NR	NR	NR	JL
11/12/90	S-50 0-2	Soil	NR	NR	NR	S	NR	JL
11/12/90	S-51 0-2	Soil	NR	NR	NR	S	NR	JL
11/12/90	S-52 0-2	Soil	NR	NR	NR	S	NR	JL
11/12/90	S-52 10-12	Soil	NR	NR	NR	NR	NR	JL
11/12/90	S-52 12-14	Soil	NR	NR	NR	NR	NR	JL
11/13/90	S-6 0-2	Soil	NR	NR	NR	U	NR	JL
11/13/90	S-6 8-9	Soil	NR	NR	NR	NR	NR	JL
11/13/90	S-16 0-2	Soil	NR	NR	NR	S	NR	JL
11/13/90	S-16 10-12	Soil	NR	NR	NR	NR	NR	JL
11/13/90	S-20 0-2	Soil	NR	NR	NR	NR	NR	JL
11/17/90	MW-23 9-11	Soil	NR	NR	NR	NR	NR	JL
11/19/90	MW-29 0-2	Soil	NR	NR	NR	NR	NR	JL
11/19/90	S-34 0-2	Soil	NR	NR	NR	S	A	JL
11/19/90	S-26 0-2	Soil	NR	NR	NR	S	A	JL
11/19/90	S-26 4-6	Soil	NR	NR	NR	NR	NR	JL
11/19/90	MW-25 0-2	Soil	NR	NR	NR	NR	NR	JL
11/19/90	MW-25 4-6	Soil	A	A	S	NR	A	NR
11/19/90	MW-25 6-8	Soil	NR	NR	NR	NR	NR	JL
11/28/90	S-78 0-2	Soil	NR	NR	NR	S	NR	JL
12/13/90	S-78 8-9	Soil	NR	NR	NR	S	NR	NR
11/28/90	S-60 0-2	Soil	NR	NR	NR	NR	NR	JL
12/13/90	S-60 4-6	Soil	A	A	S	NR	JL	NR
11/28/90	S-57 0-2	Soil	NR	NR	NR	NR	NR	JL
11/20/90	MW-33 0-2	Soil	NR	NR	NR	NR	NR	JL
11/20/90	MW-33 8-10	Soil	NR	NR	NR	NR	NR	JL

Table 1. Summary of Data Usability, Sunnyside Yard, Queens, NY

Rec Date	Sample ID	Matrix	VOA	BNA	Pest/ PCB	PCB Only	Metals	PHC
11/21/90	S-53 0-2	Soil	NR	NR	NR	S	NR	JL
11/21/90	S-53 3-5	Soil	NR	NR	NR	S	NR	NR
11/21/90	S-53 5-7	Soil	A	A	S	NR	A2	NR
11/21/90	S-53 8-10	Soil	NR	NR	NR	NR	NR	JL
11/28/90	MW-24 0-2	Soil	NR	NR	NR	NR	NR	JL
11/30/90	MW-34 0-2	Soil	A	A	S	NR	A	JL
11/30/90	MW-34 10-12	Soil	NR	NR	NR	NR	NR	JL
11/30/90	S-38 0-2	Soil	NR	NR	NR	NR	NR	JL
11/30/90	S-38 2-4	Soil	A	A	S	NR	A	NR
11/30/90	S-38 10-12	Soil	NR	NR	NR	NR	NR	JL
11/30/90	S-38 12-14	Soil	NR	NR	NR	NR	NR	JL
11/30/90	S-39 0-2	Soil	NR	NR	NR	NR	NR	JL
11/30/90	S-39 2-4	Soil	A	A	S	NR	A	NR
11/30/90	S-39 8-10	Soil	NR	NR	NR	NR	NR	JL
11/30/90	MW-24 15-17	Soil	NR	NR	NR	NR	NR	ND
12/1/90	MW-30 0-2	Soil	NR	NR	NR	S	NR	S
12/1/90	MW-30 6-8	Soil	NR	NR	NR	NR	NR	S
12/1/90	MW-30 11-13	Soil	NR	NR	NR	NR	NR	S
12/1/90	S-35 0-2	Soil	NR	NR	NR	NR	NR	S
12/1/90	S-35 8-10	Soil	A	A	S	NR	A	NR
12/3/90	S-36 0-2	Soil	NR	NR	NR	S	A	S
12/3/90	S-36 6-8	Soil	NR	NR	NR	NR	NR	S
12/3/90	S-37 0-2	Soil	NR	NR	NR	NR	NR	S
12/3/90	S-37 4-6	Soil	A	A	S	NR	A	NR
12/3/90	S-37 8-10	Soil	NR	NR	NR	NR	NR	S
12/3/90	S-37 14-16	Soil	NR	NR	NR	NR	NR	S
12/3/90	MW-27 0-2	Soil	NR	NR	NR	NR	NR	S
12/3/90	MW-27 7-9	Soil	NR	NR	NR	NR	NR	S
12/3/90	MW-27 14-16	Soil	NR	NR	NR	NR	NR	S
12/6/90	S-32 0-2	Soil	NR	NR	NR	S	A	S
12/6/90	S-19 0-2	Soil	NR	NR	NR	NR	NR	S
12/6/90	S-25 0-2	Soil	NR	NR	NR	NR	NR	S
12/6/90	S-25 12-14	Soil	NR	NR	NR	NR	NR	S
12/6/90	S-25 19-21	Soil	NR	NR	NR	NR	NR	S
12/6/90	MW-26 0-2	Soil	NR	NR	NR	NR	NR	S
12/6/90	S-19 9-11	Soil	NR	NR	NR	NR	NR	S

Table 1. Summary of Data Usability, Sunnyside Yard, Queens, NY

Rec Date	Sample ID	Matrix	VOA	BNA	Pest/ PCB	PCB Only	Metals	PHC
12/6/90	MW-26 9-11	Soil	A	U	S	NR	A	NR
12/6/90	MW-26 12-14	Soil	NR	NR	NR	NR	NR	S
12/8/90	MW-21 0-2	Soil	NR	NR	NR	S	A	S
12/8/90	MW-19 0-2	Soil	NR	NR	NR	S	A	S
12/13/90	MW-20 0-2	Soil	NR	NR	NR	S	A	S
12/14/90	S-33 0-2	Soil	NR	NR	NR	NR	NR	S
12/14/90	S-33 4-6	Soil	A	A	S	NR	JL	S
10/29/90	WM	Aqueous	NR	NR	NR	NR	NR	NR
11/9/90	S-41A	Aqueous	A	NR	NR	NR	NR	NR
11/17/90	UST-1	Aqueous	NR	NR	NR	NR	NR	NR
10/10/90	FB-1-SS	Aqueous	NR	NR	NR	NR	NR	NR
10/10/90	FB-2-PD	Aqueous	NR	NR	NR	NR	NR	NR
10/10/90	TB-1	Aqueous	NR	NR	NR	NR	NR	NR
10/18/90	FB-3-SS	Aqueous	NR	NR	NR	NR	NR	NR
10/18/90	FB-4-PD	Aqueous	NR	NR	NR	NR	NR	NR
10/18/90	TB-2	Aqueous	NR	NR	NR	NR	NR	NR
10/29/90	FB-5-SS	Aqueous	NR	NR	NR	NR	NR	NR
10/29/90	FB-6-PD	Aqueous	NR	NR	NR	NR	NR	NR
10/29/90	TB-3	Aqueous	NR	NR	NR	NR	NR	NR
11/7/90	FB-7-SS	Aqueous	NR	NR	NR	NR	NR	NR
11/7/90	FB-8-PD	Aqueous	NR	NR	NR	NR	NR	NR
11/7/90	TB-4	Aqueous	NR	NR	NR	NR	NR	NR
12/3/90	FB-9-SS	Aqueous	NR	NR	NR	NR	NR	NR
12/3/90	FB-10-PD	Aqueous	NR	NR	NR	NR	NR	NR
12/3/90	TB-5	Aqueous	NR	NR	NR	NR	NR	NR
1/4/91	MW-32	Aqueous	A	NR	S	NR	A4	JL
1/4/91	MW-26	Aqueous	A	U	S	NR	A4	JL
1/4/91	MW-29	Aqueous	A	JL	S	NR	A4	JL
1/5/91	MW-19	Aqueous	A	A	S	NR	A	JL
1/5/91	MW-25	Aqueous	A	JL	S	NR	A	JL
1/8/91	MW-13	Aqueous	A	A	S	NR	A4	JL
1/8/91	MW-23	Aqueous	A	JL	S	NR	A4	JL
1/8/91	MW-1	Aqueous	A	JL	S	NR	A4	JL
1/8/91	MW-9	Aqueous	A	JL	S	NR	A4	JL
1/5/91	MW-33	Aqueous	A	A	S	NR	A	JL

Table 1. Summary of Data Usability, Sunnyside Yard, Queens, NY

Rec Date	Sample ID	Matrix	VOA	BNA	Pest/ PCB	PCB Only	Metals	PHC
1/4/91	MW-28	Aqueous	NR	A	S	NR	NR	NR
1/4/91	MW-28	Aqueous	A	NR	NR	NR	A	JL
1/8/91	Tank 1	Aqueous	NR	NR	NR	S	NR	NR
1/8/91	Tank 2	Aqueous	NR	NR	NR	S	NR	NR

Data Qualifiers

A = (usable) - data generated in compliance with the protocol and used as quantitative (actual).
A1 = Sample estimated high for toluene only.
A2 = Sample estimated high for mercury only.
A3 = Sample unusable for selenium.
A4 = Sample estimated high for lead and chromium.
JH = Estimated biased high - these data have recoveries (matrix spike or surrogate spike) greater than required range, or method blanks contained high concentrations of a compound.
JL = Estimated biased low - these data indicate that holding times or reextraction time have been exceeded; recoveries are lower than the required range for matrix or surrogate spike recovery; matrix interference; PHC method blank concentration is greater than 0, and system linearity is reasonable.
S = Usable as a screening technique - these data are nocompliant with several protocol requirements, but correspond to other methods of testing (i.e., TPH uses PID readings) or previous sampling results (PCB data).
U = Unusable - these data exceed protocol requirements for several parameters.
ND = No data.
NR = Not required.

Table 2. Summary of Proposed Work.

Supplemental RI Work Proposed in the RI Report			Proposed
Area		Media/Analytes	Additional/Confirmatory Samples
1	Install 3 deep monitoring wells (MW-38, MW-39, MW-40) adjacent to MW-19, MW-9, MW-2. Resample MW-23.	Water/VOCs, PCBs	Resample MW-1 - PCBs/Metals Hand boring S-105 adjacent to S-1 (0-2') - PCBs Resample MW-23 for SVOCs Hand boring S-107 adjacent to S-76 (0-2') - PCBs
2	Install shallow monitoring well MW-41 and 3 soil borings (S-96, S-97, S-98) for UST investigation	Water/VOCs Soil/VOCs	Hand boring S-117 adjacent to S-43 (0-2') - PCBs/Mercury Resample MW-29 - Metals
4	Install shallow monitoring well MW-42	Water/VOCs, SVOCs	One soil sample MW-42 (2'-4') - PCBs
5	No proposed work		Hand borings in 2 locations - S-108, S-109 (0-2') - PCBs
7	Install upgradient shallow monitoring well MW-37	Water/VOCs, SVOCs	Hand boring S-106 adjacent to S-67 and S-68 (0-2') - PCBs
8	Six perimeter hand borings (S-99, S-100, S-101, S-102, S-103, S-104)	Soil/PCBs	Hand borings S-112, S-111, S-110 adjacent to S-6, S-52, S-53 (0-2') - PCBs
9	No proposed work		Resample MW-27 - PCBs Hand boring S-115 adjacent to S-58 (0-2') - PCBs
10	No proposed work		Hand boring S-114 adjacent to S-83 (0-2') - PCBs
13	No proposed work		Hand boring S-116 adjacent to S-74 (0-2') - PCBs
15	Field filter sample MW-25	Water/PCBs	Sample MW-25 - Metals (unfiltered)
16	Install shallow monitoring well MW-43	Water/VOCs, SVOCs	One soil sample MW-43 (1'-3')- PCB
17*	No proposed work		One soil boring S-113 adjacent to S-60 (0-2') - PCBs

* Proposed area of concern

PLATES

APPENDIX J

Work Plan for the Removal of
the Underground Storage Tank
Located at the Receiving Area (Area 2)

WORK PLAN FOR THE REMOVAL OF THE UNDERGROUND STORAGE TANK LOCATED AT THE RECEIVING AREA (AREA 2)

Sunnyside Yard
Queens, New York

March 4, 1991

Revised October 10, 1991

Prepared for:

National Railroad Passenger Corporation
Washington, D.C.

Prepared by:

ROUX ASSOCIATES, INC.
775 Park Avenue
Huntington, New York 11743

ROUX

CONTENTS

FIGURES

APPENDICES

1.0 INTRODUCTION

This Work Plan is submitted by Roux Associates, Inc. (Roux Associates) at the request of the National Passenger Railroad Corporation (AMTRAK) for the investigation, removal and remediation of an underground storage tank (UST) at the Sunnyside Yard, Queens, New York (Yard). Roux Associates was retained by AMTRAK to conduct a facility-wide Remedial Investigation/ Feasibility Study (RI/FS) at the Yard. During the RI phase, a hydrocarbon release was detected in the subsurface. Upon further investigation, an UST was discovered in the vicinity of the receiving area (Area 2) of the commissary building (Figure 1).

2.0 INITIAL INVESTIGATION

During the RI field investigation, a gasoline odor was detected in a soil sample collected from 2 to 4 feet (ft) below land surface (bls) in boring S-41 (Figure 1), located approximately 10 ft from the UST. To further investigate the possible subsurface contamination, a subsequent boring, S-41A (Figure 1), was drilled adjacent to boring S-41 to collect a sample for volatile organic compound (VOC) analysis. In a soil sample collected at 3 to 5 ft bls in boring S-41A, VOCs were detected in the following concentrations:

acetone - 293 micrograms per kilogram (ug/kg) (0.293 ppm);
ethylbenzene - 67 ug/kg (0.067 ppm); and
xylenes (total) - 137 ug/kg (0.137 ppm).

The reported concentrations for soil analyses have been adjusted to reflect a dry weight rather than wet weight reporting basis as was presented in the January 10, 1991, initial draft Work Plan.

In a water sample obtained in boring S-41A, VOCs were detected in the following concentrations:

ethylbenzene - 98 micrograms per liter (ug/L) (0.098 ppm); and
xylenes (total) - 275 ug/L (0.275 ppm).

A sample of the tank contents (water/product mixture) was obtained and VOCs were detected in the following concentrations:

2-butanone - 3,660 ug/L (3.66 ppm);
toluene - 3,830 ug/L (3.83 ppm);
ethylbenzene - 24,400 ug/L (24.4 ppm); and
xylenes (total) - 92,000 ug/L (92.0 ppm).

Based upon the results of the field investigation and laboratory analysis, and information provided during personal communications with AMTRAK personnel, Roux Associates concludes the following.

- An approximately 800 gallon UST exists beneath a 3 ft by 8 ft concrete pad located between the radio shop and a flammable gas storage shed and contains approximately 500 gallons of liquid.

- According to Yard personnel, the UST was most probably used for petroleum hydrocarbon (gasoline) storage, but may have also been used for solvent storage from a once active painting operation.

- The high concentrations of toluene, ethylbenzene and xylenes (primary constituents of gasoline) in the tank contents suggests that the UST contains hydrocarbons and water.

- The presence of 2-butanone in the tank contents indicates that solvents may have been stored in the tank at some time.

- The presence of hydrocarbon constituents and solvents in the soil and groundwater samples near the UST suggest that the tank may have overflowed or leaked.

3.0 RECOMMENDATIONS

Roux Associates' recommendations are based upon the results of the field investigation and laboratory analysis, knowledge of the Yard, and experience in UST investigations in the Queens, New York, area. All work will be performed under the supervision of a Roux Associates hydrogeologist. All invasive work performed during this investigation will be in accordance with the Health and Safety Plan (HASP) included as Appendix A. This is a revised version of the HASP included as Appendix A of the February 27, 1990, "Work Plan for the Remedial Investigation and Feasibility Study, Sunnyside Yard, Queens, New York."

3.1 Task I - UST Removal

- The tank contents will be pumped out using a vacuum truck, containerized, transported off site, and disposed of in accordance with appropriate requirements. Documentation of proper disposal will be provided.
- The 3 ft by 8 ft concrete pad will be removed.
- The tank will be uncovered and removed from the ground, along with any accessible associated piping.
- The tank will be rendered inert by use of carbon dioxide (CO_2) and cut open on both ends using a non-sparking hydraulic nibbler. The tank will then be degassed, cleaned, and transported off-site for recycling. The cleaning procedure will include the following: the tank will be cut in half using the non-sparking hydraulic nibbler and cleaned without entry; the inside of the tank will be steam cleaned; all materials used or generated in the cleaning process will be containerized and properly disposed of. The tank will be visually inspected by the on-site hydrogeologist to assure that all of the contents have been removed before it is transported off-site.

3.2 Task II - Contaminated Soil Removal

- Prior to excavation of the tank and surrounding soils, soil samples will be collected from three pre-excavation borings (Figure 1) and will be analyzed for VOCs to determine the extent and degree of contamination (see Section 3.5, Task V).
- An estimate of the volume of soil to be excavated and the disposal requirements will be determined based upon a review of the pre-investigation boring data.
- Soil in the excavation will be investigated for the presence of hydrocarbon contamination by noting any visual staining and screening the soil with a photoionization detector (PID) for VOCs.
- The visually contaminated soil around the tank will be excavated to the water table.

- The soil will be removed from the site within 90 days from the date that it was excavated and will be transported and disposed of in accordance with New York State's requirements. Documentation of proper disposal will be provided.

- While the excavated soil is temporarily stored on-site, the soil will be staged in an area located to the north of the Metro Shop and will be stored in a manner designed to preclude any contamination of the staging area and any exposures to on-site personnel.

- The soil will be placed on competent plastic sheeting with a berm constructed around the edges to prohibit any runoff.

- The soil will be covered and secured with plastic sheeting to prevent rainwater from infiltrating the soil pile; to prevent airborne spread of contaminated soil; to prevent exposure of on-site personnel to the soil; and to limit the amount of vapors emanating from the soil.

- The size and shape of the soil pile will be determined by the volume of material excavated and by the space available for staging.

- The area will be designated off limits to on-site personnel by the use of caution tape and appropriate placards.

- Representative samples will be collected from the soil stockpile on the last day of the excavation work. The soil sampling will be performed for waste classification purposes. The analyses to be performed will include VOC (Method 8240), TCLP, corrosivity (pH), ignitability, and reactivity.

  Excavated soil will be separated into two stockpiles, each containing soil of a relatively equal degree of contamination based upon visual examination and PID screening. A representative sample will be collected from each stockpile and submitted for analysis. We propose to sample three locations, at varying depths, within each stockpile and to composite the samples in the field to obtain one representative sample per stockpile.

- Post-excavation sidewall soil samples will be collected from the excavation and will be analyzed using USEPA Method 8240 which includes benzene, toluene, ethylbenzene, xylene (BTEX), 2-butanone (MEK), and acetone.

- Soil and ground-water samples will be analyzed according to the NYSDEC Analytical Services Protocols (ASP) procedures. However, ASP Quality Assurance/Quality Control (QA/QC) documentation will not be requested and data validation will not be performed.

The proposed clean-up levels provided by the NYSDEC for the compounds detected in the soil are the following:

benzene	0.5 ppm
toluene	1.5 ppm
xylene (total)	1.2 ppm

ethylbenzene	5.5 ppm
acetone	0.11 ppm
2-butanone	0.3 ppm

3.3 Task III - Liquid Removal

- If free product is present in the excavation, it will be pumped out with the vacuum truck.

3.4 Task IV - Backfill of Excavation

- Following excavation work, sidewall samples will be collected as described above and the excavation will be backfilled with clean sand.
- If BTEX, MEK or acetone contamination is detected in the sidewall samples, a decision will be made whether to reopen and continue the excavation or to mitigate further contamination during a remediation phase.
- Any piping that was unable to be removed (e.g., beneath a foundation or tracks) will be capped and abandoned in place.

3.5 Task V - Define Extent of Subsurface Contamination

The location of the UST near the flammable gas storage shed, the radio shop, the concrete pavement of the receiving area, active and abandoned tracks, underground sewers, and water and electric lines severely limits the scope of the investigation that can be conducted to define the extent of potential subsurface contamination.

- Roux Associates proposes to incorporate the data obtained from the five soil borings drilled in the immediate area (Figure 1), as part of the RI, into this investigation and proposes to install three pre-excavation borings (Section 3.2, Task II) to better define the extent of potential contamination and assist in determining disposal requirements of the soil. The soil borings will be sampled continuously from grade to 5 ft below the water table (approximately 10 ft bls). The soil samples will be visually inspected in the field for staining and screened with a PID for VOCs. Based upon PID readings and location relative to the UST, approximately four boring samples will be submitted for laboratory analysis with a specified three-day laboratory turnaround. The results of these analyses will be used to estimate the volume of soil to be excavated, thereby insuring an adequate area is prepared for temporary stockpiling prior to removal and disposal.
- Soil samples from the borings will be analyzed using USEPA Method 8240 which includes benzene, toluene, ethylbenzene, xylene (BTEX), acetone and 2-butanone (MEK). Total petroleum hydrocarbons (PHC) analysis will not be performed on the samples so that we can differentiate the contaminants associated with the UST

from others that might be encountered. The site-wide delineation of petroleum hydrocarbon contaminated soil is being addressed in the Remedial Investigation.

- One monitoring well will be installed hydraulically downgradient of the UST. During drilling, soil samples will be collected continuously to 7 ft below the water table (approximately 13 ft bls) and screened in the field for evidence of contamination as previously described. The observations will be recorded on the field logs. The monitoring well will be constructed of 10 slot, 4-inch diameter stainless steel well screen set from 7 ft below to 3 ft above the water table. A 4-inch diameter threaded PVC casing will extend from the top of the well screen to land surface. A Morie No. 1 equivalent gravel pack will be placed in the annulus around the well screen and will extend approximately 1 ft above the top of the screened interval. A 1 ft bentonite plug will be placed on top of the gravel pack and hydrated with potable water. A protective casing will be grouted in place and a locking cap will be installed on the well. Upon completion, the monitoring well will be developed by mechanical surging and pumping with a centrifugal pump (or bailer, depending on the hydraulic properties of the well) to ensure that a good connection exists between the aquifer and the well screen. If free product is present, the development water will be containerized and disposed of properly. If no free product is present, a "recharge-pit" will be constructed, as specified in the RI/FS Work Plan, and the development water will be allowed to infiltrate back into the ground adjacent to the well.

- The drill cuttings from soil borings will be used to backfill the boreholes. Contaminated drill cuttings requiring containment may be generated while installing the monitoring well. Therefore, all cuttings generated during installation of the monitoring well will be stockpiled with the evacuated soil.

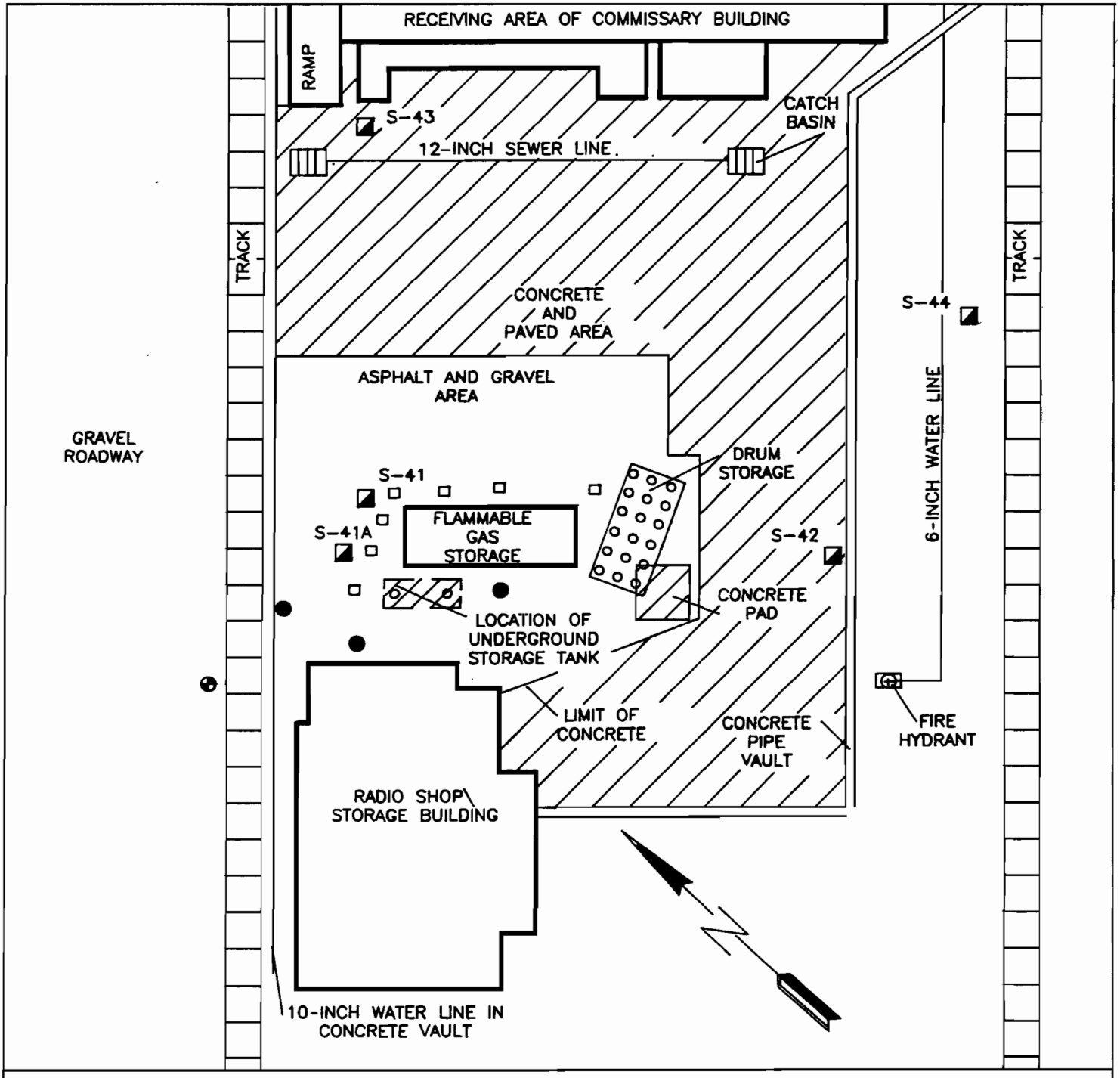
3.6 Task VI - Ground-Water Sampling

The ground-water samples will be analyzed using USEPA Method 624 which includes benzene, toluene, ethylbenzene and xylene (BTEX). In addition, acetone and 2-butanone will be incorporated into the analysis. A field blank and trip blank will be analyzed to insure the integrity of the sample.

As requested by the NYSDEC, Roux Associates has considered performing ground-water analysis using USEPA Method 524.2. However, it is Roux Associates' opinion that this method is unsuitable because the present concentrations of contaminants are considerably higher than the detection levels mandated for drinking water standards (Method 524.2), and therefore the analysis will result in inconclusive data. This method can be employed, if required, for final closure after remediation is completed.

3.7 Task VII - Report Preparation

Upon completion of the field investigation and receipt of the laboratory analytical data, a report will be prepared that summarizes the data, findings, and conclusions derived from the investigation and any recommendations, if appropriate.



EXPLANATION

S-43 LOCATION AND DESIGNATION OF SOIL BORING

LOCATION OF PROPOSED SOIL BORING

LOCATION OF PROPOSED MONITORING WELL

CONCRETE

LOCATION OF STEEL POSTS

0 20 40 FT.

APPROXIMATE

Title:

SITE PLAN INCLUDING THE LOCATION OF UNDERGROUND STORAGE TANK, SOIL BORINGS AND MONITORING WELL

Prepared For: AMTRAK CORPORATION

ROUX ASSOCIATES INC

Compiled by: B.W.	Date: 12/90	FIGURE 1
Prepared by: C.L.	Scale: SHOWN	
Project Mgr: J.D.D.	Revision: 2/91	
File No: 05509LUS		

APPENDIX A

Health and Safety Plan

APPENDIX A

Health and Safety Plan

1.0 INTRODUCTION

This plan outlines health and safety procedures to be followed by Roux Associates, Inc.'s (Roux Associates) employees and subcontractors hired by Roux Associates during any site investigation and cleanup activities performed at the Yard. This health and safety plan was developed in accordance with current OSHA guidelines outlined in 29 CFR Part 1910.

These procedures include emergency chain of command, personnel protective equipment, basic safety equipment, air monitoring, training program, employee medical surveillance program, and decontamination of personnel and equipment.

A Health and Safety Officer (HSO) will be appointed to ensure all that all Health and Safety Plan (HASP) activities are correctly implemented. The HSO's resume will be submited to NYSDEC prior to the start of the investigation.

2.0 EMERGENCY PROCEDURES

If a medical emergency occurs, only limited first aid will be available onsite. If the victim(s) cannot be transported without substantial risk, call for an ambulance. If the victim(s) can be transported without substantial risk of additional injury, the nearest hospital is:

Astoria General Hospital
25-10 30th Avenue
Astoria, NY
General Number : (718) 932-1000

2.1 Emergency Phone Numbers

In case of the need for emergency help, the following phone numbers will be maintained at the site:

Police Emergency	911
AMTRAK Police	(212) 630-7113 (ATS: 521-7113)
AMTRAK Environmental Control	(212) 630-7249
AMTRAK Yard Facility Manager	(212) 630-7565
Fire Emergency	(718) 847-6600
Ambulance	911
Poison Control Center	(800) 962-1253
National Response Center	(800) 424-8802

2.2 Chain of Command

In case of difficulties at the site requiring notification of Roux Associates the following is Roux Associates' contacts listed in order of priority:

Roux Associates, Inc.
775 Park Avenue, Suite 255
Huntington, New York 11743
(516) 673-7200

Joseph Duminuco, Roux Project Manager
Home Phone Number (516) 735-3140

Linda Wilson, Roux Health and Safety Officer
775 Park Avenue, Suite 255
Huntington, New York 11743
(516) 673-7200

3.0 PERSONNEL PROTECTIVE EQUIPMENT

Based on the available information, it is anticipated that a modified version of Level D protection will be adequate for most tasks to be performed at the site.

The modified level D protection will consist of:

(a) Coveralls, disposable (poly-coated Tyvek)
(b) Gloves, chemical resistant, disposable
(c) Boots, chemical resistant, disposable
(d) Hard hat
(e) Safety glasses or chemical splash goggles.

A photoionization analyzer will continuously monitor the work zone for changes in organic vapor levels. Level D areas are defined as areas where gross ambient organic vapor levels (monitored on a real time basis) are from site background to 5 ppm.

Level D protection will be upgraded to Level C protection if concentrations of organic vapors exceed 5 parts per million (ppm) or toxic airborne substances are known or suspected.

Level C areas are defined as areas where gross ambient organic vapor levels (monitored on a real-time basis) are greater than 5 ppm but less than 500 ppm or where the presence of toxic airborne substances are known or suspected.

Level C Protection consists of:

(a) Full face air-purifying respirator (OSHA/NIOSH approved)
(b) Coveralls, disposable (poly-coated Tyvek or Saranex)
(c) Gloves, chemical resistant, disposable (taped to coveralls)
(d) Boots, chemical resistant, disposable (taped to coveralls)
(e) Hard hat

Work will cease if levels of organic vapors exceed 500 ppm. If this condition persists in the work zone, the work plan will be modified to a higher level of protection.

When the possibility exists that explosive gases may be released from the soils during excavation and drilling operations, the atmosphere will be monitored with an explosimeter. When levels approach the lower explosive limit (25 percent L.E.L.), work will cease until explosive gases have sufficiently dispersed.

It will be the responsibility of the senior on-site Roux Associates representative to inform all on-site Roux Associates personnel of the level of personnel protection required in all work situations. All contractors and subcontractors are responsible for supplying their personnel with the necessary safety equipment.

Basic safety equipment will be kept on-site for monitoring and responding to emergency situations. In addition to equipment previously mentioned, basic safety equipment will include, but is not limited to, the following:

(a) portable eye wash
(b) ABC type fire extinguishers
(c) first aid kits
(d) photoionization analyzer

4.0 EMPLOYEE MEDICAL SURVEILLANCE PROGRAM

All Roux Associates employees involved in field operations have had medical examinations. Follow-up exams are conducted at a frequency of every 12 months for employees involved in field investigations. All contractors and subcontractors are responsible for their own medical surveillance programs.

5.0 TRAINING PROGRAM

All personnel who enter work zone (the designated area where activities are being performed pursuant to this Work Plan) must have received a minimum of forty hours of comprehensive health and safety training in accordance with 29 CFR Part 1910. All contractors and subcontractors will assume responsibility for the training of their personnel.

It will be required that all Roux Associates personnel (including all contractors and subcontractors) scheduled to perform work in the work zone review a copy of this Health and Safety Plan.

In addition to the procedures outlined in this Plan, all Roux Associates personnel (including all contractors and subcontractors) will be informed of any applicable Yard safety rules to be observed while working at the Yard.

6.0 DEFINITION OF WORK AREAS AND DECONTAMINATION PROCEDURES

Based on health and safety considerations, certain areas at the Yard may be considered a restricted "workzone" while work is taking place. If restricted access is necessary, the appropriate work zone, including but not limited to any heavy equipment, drill rig and all associated sampling equipment located therein, will be a restricted access area. Entry to and exit from the work zone will be provided only to those persons directly involved in tasks associated with the work plan and only if the prescribed level of personnel protection is worn. Prior to leaving a restricted access area all personnel and equipment will be decontaminated.

During the actual uncovering and removal of the UST, the workers in the adjacent "radio shop" will be evaucated as a precaution. In addition, the contents of the adjacent flammable gas storage pad will be removed before the excavation work begins.

If 5 ppm organic vapors is exceeded in the work (exclusion) zone, air monitoring will be undertaken between the exclusion zone and the nearest downwind, non-RI related target population. Work will be suspended if readings exceed 5 ppm outside of the exclusion zone.

Areas are defined as levels C or D corresponding to the level of personnel protection required for each situation.

6.1 Restricted Access Area Level D

Level D access will be areas in which no health hazards are known to exist and where organic vapor concentrations are below 5 ppm. All Roux Associates personnel entering the work zone are required to be wearing Level D personnel protection as described in Section 3.0 of this Health and Safety Plan.

Decontamination procedures prior to leaving Level D areas will consist of brushing loose soil from clothing and equipment, and washing equipment with mild detergent and water. Disposable gloves, boots, scoops, paper towels and Tyvek suits will be discarded in the trash receptacles provided within these areas. Drill rigs will be brushed clean of soil.

6.2 Restricted Access Area Level C

Level C access will be those areas where organic vapors exceed 5 ppm (but less than 500 ppm), or where the presence of toxic airborne substances are known or suspected to exist.

Entry to Level C areas will be provided only to those Roux Associates and subcontractor personnel wearing Level C personnel protection as described in Section 3.0 of this Plan.

Liquid wastes generated in Level C restricted access areas will be drummed for proper disposal. Dry material such as suits and gloves will be disposed of in accordance with state and federal guidelines.