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Station # 12

ENGINEERING DATA TRANSMITTAL

Page 1 of 1

1. EDT 160835

2. To: (Receiving Organization) DISTRIBUTION	3. From: (Originating Organization) Geosciences Group	4. Related EDT No.: NA
5. Proj./Prog./Dept./Div.: 200 Areas Treated Effluent Disposal Facility	6. Cog. Engr.: C. D. Delaney	7. Purchase Order No.: NA
8. Originator Remarks: Approval and Release		9. Equip./Component No.: NA
		10. System/Bldg./Facility: NA
11. Receiver Remarks:		12. Major Assm. Dwg. No.: NA
		13. Permit/Permit Application No.: NA
		14. Required Response Date: 2/28/93

MAR 1993 RECEIVED EDMC

15. DATA TRANSMITTED

(A) Item No.	(B) Document/Drawing No.	(C) Sheet No.	(D) Rev. No.	(E) Title or Description of Data Transmitted	(F) Impact Level	(G) Reason for Transmittal	(H) Originator Disposition	(I) Receiver Disposition
1	WHC-SD-EN-TP-025		Q	Hydrologic Test Plan - W-049H 200 Areas Treated Effluent Disposal Facility	3Q	1/2	1	

16. KEY

Impact Level (F)	Reason for Transmittal (G)	Disposition (H) & (I)
1, 2, 3, or 4 (see MRP 5.43)	1. Approval 2. Release 3. Information 4. Review 5. Post-Review 6. Dist. (Receipt Acknow. Required)	1. Approved 2. Approved w/comment 3. Disapproved w/comment 4. Reviewed no/comment 5. Reviewed w/comment 6. Receipt acknowledged

17. SIGNATURE/DISTRIBUTION (See Impact Level for required signatures)

(G) Reason	(H) Disp.	(J) Name	(K) Signature	(L) Date	(M) MSIN	(J) Name	(K) Signature	(L) Date	(M) MSIN	(G) Reason	(H) Disp.
1	1	Cog.Eng. C. D. Delaney	C D Delaney	2/22/93	H6-06						
1	1	Cog. Mgr. R. L. Jackson	RLJackson	2/22/93	H6-06						
1	1	QA W. R. Thackaberry	WR Thackaberry	2/22/93		J. E. Thrasher	Joseph E. Thrasher	2/22/93	R3-46	1	1
		Safety									
		Env.				EDMC (2)			H6-08		
1	1	J. D. Davis (6)	J. D. Davis	2/22/93		CENTRAL File (2)			L8-04		
1	1	L. C. Swanson	LC Swanson	2/22/93	H6-06	ERC			H6-07		

18.	19.	20.	21. DOE APPROVAL (if required)
C. D. Delaney C D Delaney 2/22/93 Signature of EDT Originator / Date	Authorized Representative for Receiving Organization / Date	R L Jackson 2/22/93 Cognizant/Project Engineer's Manager / Date	Ltr. No. [] Approved [] Approved w/comments [] Disapproved w/comments

BD-7400-172-2 (07/91) GEF097

BD-7400-172-1 (07/91)

SUPPORTING DOCUMENT

1. Total Pages 53

2. Title

Hydrologic Test Plan - W-049H 200 Areas Treated Effluent Disposal Facility

3. Number

WHC-SD-EN-TP-025

4. Rev No.

Ø

5. Key Words

W-049H
Constant Discharge Aquifer Test
Hydrogeology
Uppermost Aquifer
Slug injection/withdrawal analyses

6. Author

Name: C. D. Delaney

C. D. Delaney
Signature

Organization/Charge Code ~~Geosciences/AC2C1~~ 81235/R4GD1

APPROVED FOR PUBLIC RELEASE

3/2/93 N. Solis

7. Abstract

Hydrologic tests are to be conducted at the site proposed for construction of the Project W-049H Treated Effluent Disposal Facilty (TEDF). The TEDF is an infiltration basin proposed for disposal of treated effluent from the 200 Areas of the Hanford Site. Single well constant discharge tests are planned at three characterization/groundwater monitoring wells recently installed at the TEDF site.

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9. Impact Level 3Q

10. RELEASE STAMP

OFFICIAL RELEASE BY WHC (11)
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1.0 INTRODUCTION

Hydrologic tests are to be conducted at the site proposed for construction of the Project W-049H Treated Effluent Disposal Facility (TEDF). The TEDF is an infiltration basin proposed for disposal of treated effluent from the 200 Areas of the Hanford Site. The candidate site is bounded by Hanford Site coordinates N40119, N41595, W35726, and W37202. Single well constant discharge tests are planned at three characterization/groundwater monitoring wells recently installed at the TEDF site (Figure 1). Results from the aquifer tests will be utilized for hydrogeologic site characterization and determination of hydraulic conductivity input parameters for computer simulation of groundwater flow and advective transport.

1.1 SCOPE

This test plan provides technical guidance for performing constant discharge tests at three wells in accordance with Section 5.7, "Aquifer Testing" of the *Site Characterization Work Plan -- 200 Areas Treated Effluent Disposal Basin, Project W-049H* (Davis and Delaney, 1992). The test plan also includes instructions on test design, pumping well design, and test data collection requirements. The tests will be performed at wells 699-40-36, 699-41-35, and 699-42-37 (Figure 1).

1.2 PURPOSE AND OBJECTIVES

The purpose of this test plan is to specify design and implementation requirements for conducting constant discharge aquifer tests. The primary data quality objective for the testing is to provide reliable values of hydraulic parameters for the uppermost aquifer at the test sites. Upon completion of the testing, drawdown and discharge data will be available from which to estimate the transmissivity of the uppermost aquifer.

This test plan provides the following technical information and direction for performing the tests:

- An overview of the hydrogeology of the test site
- An analysis of previously conducted slug tests to determine general hydraulic parameters of the test zone at each test site
- Specifications for well construction and design
- Test design, equipment, and data collection requirements
- Applicable procedures and quality assurance guidelines
- Requirements for handling of the purgewater that will be generated during the tests.

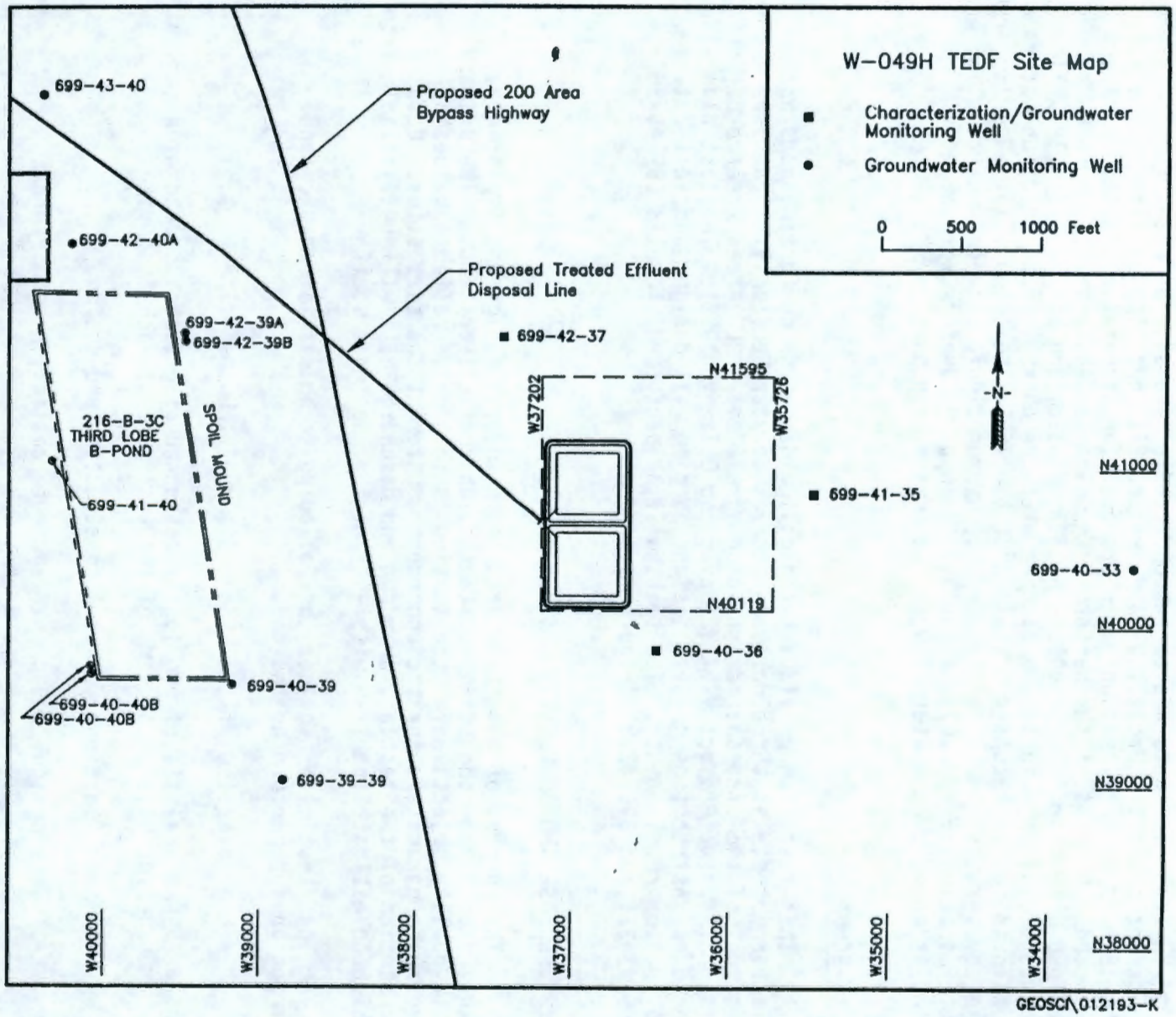

Figure 1. Hydrologic Test Location--W-049H 200 Areas Treated Effluent Disposal Facility.

2.0 SITE HYDROGEOLOGY

The hydrogeology of the site proposed for the TEDF was determined from examination of well logs and integration of these data with published stratigraphic correlations. For a detailed discussion of the hydrogeology in the vicinity of the TEDF site, refer to Davis and Delaney (1992) and Delaney et al. (1991). A brief discussion of the hydrogeology of the TEDF site follows.

The stratigraphic units of interest at the TEDF site are the Elephant Mountain Basalt Member, Ringold Formation and the Hanford formation (Figures 2 and 3). Deeper zones are not of interest in the context of Project W-049H because disposal to the TEDF site is not expected to affect deeper aquifers.

The uppermost aquifer in the vicinity of the TEDF site is dominated by the fluvial gravels (unit A) and the lower mud (LM) sequence of the Ringold Formation. The saturated unit A ranges from 40 to 70 ft thick under the TEDF site and overlies the basalt of the Elephant Mountain Member. The basalt surface ranges in depth from 250 to 270 ft beneath the site and dips approximately 1° to the southwest.

Based on slug tests recently conducted at the TEDF site, hydraulic conductivities of the Ringold Unit A generally range from 1.3 to 2.7 ft/day and transmissivities range from 100 to 370 ft^2/day (Appendix B). A 15 to 25-ft-thick fine-grained facies occurs within the Ringold Unit A, and appears to be saturated based on moisture content data.

Stratigraphically above unit A, a 40 to 70-ft thick LM sequence of silts and clays occurs in the Ringold Formation at the TEDF site. These fine-grained sediments confine the saturated A unit. The confining zone pinches out to the west, beneath the A lobe of B Pond. A mean hydraulic conductivity of 5.5×10^{-7} cm/sec was measured for these fine-grained sediments based on permeameter tests of split-spoon samples from the unit. Water is generally not encountered until drilling reaches the fluvial gravels. The hydraulic head then rises to approximately the top of the LM sequence because of locally confining conditions.

The unsaturated zone beneath the TEDF site ranges from 90 to 110 ft thick. Unsaturated sediments consist of the gravel facies of the Hanford formation. At this location, the Hanford formation is predominantly sandy gravel. Up to 2 ft of perched water was found immediately above the LM sequence in well 699-40-36, south of the TEDF site (Figure 1). The source of the perched water may be effluent disposed to the 216-B-3 Pond system located northwest of the TEDF site. The moisture content of unsaturated Hanford formation sediments beneath the TEDF site averages about 6%.

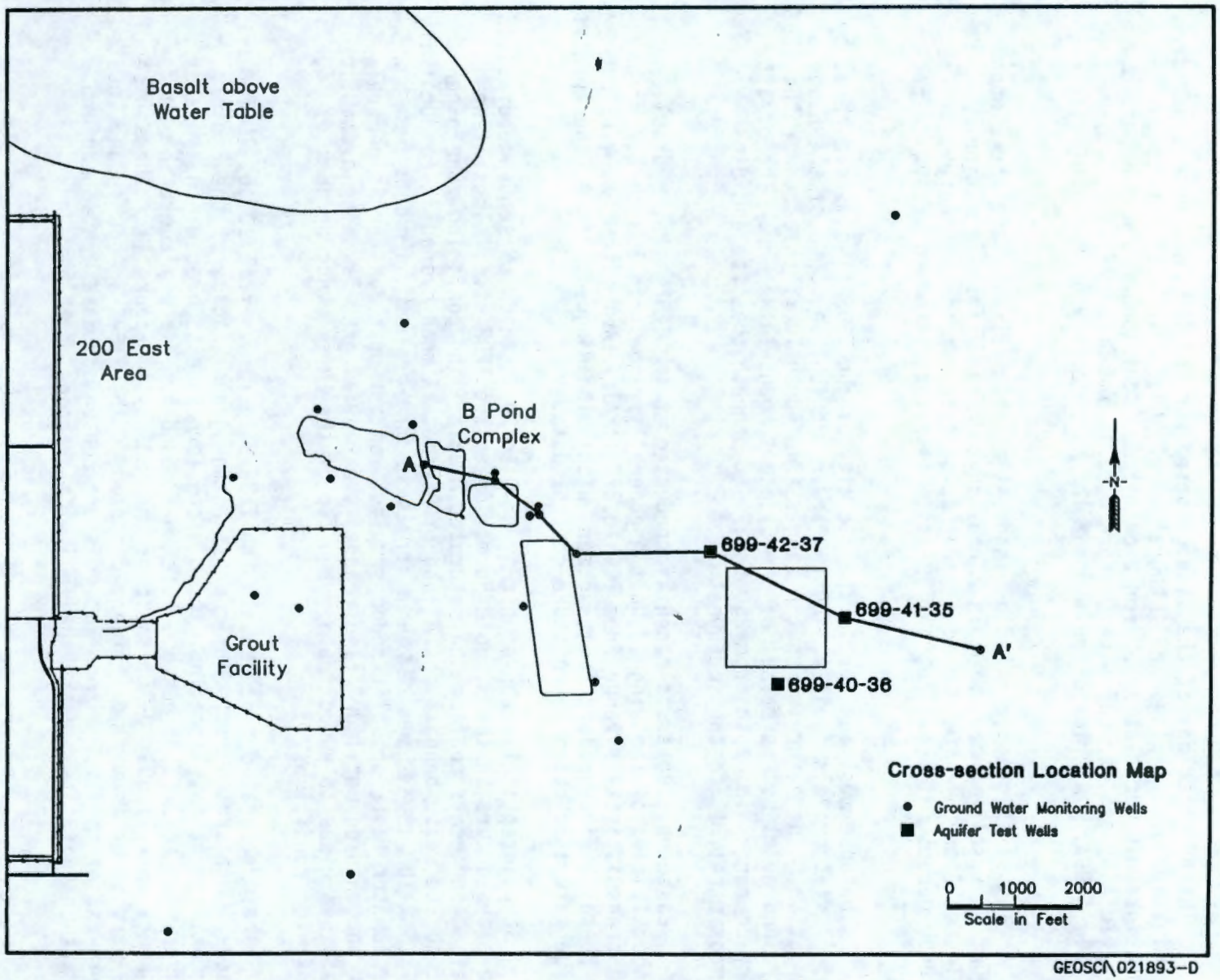

Figure 2. Geologic Cross-section Location Map.

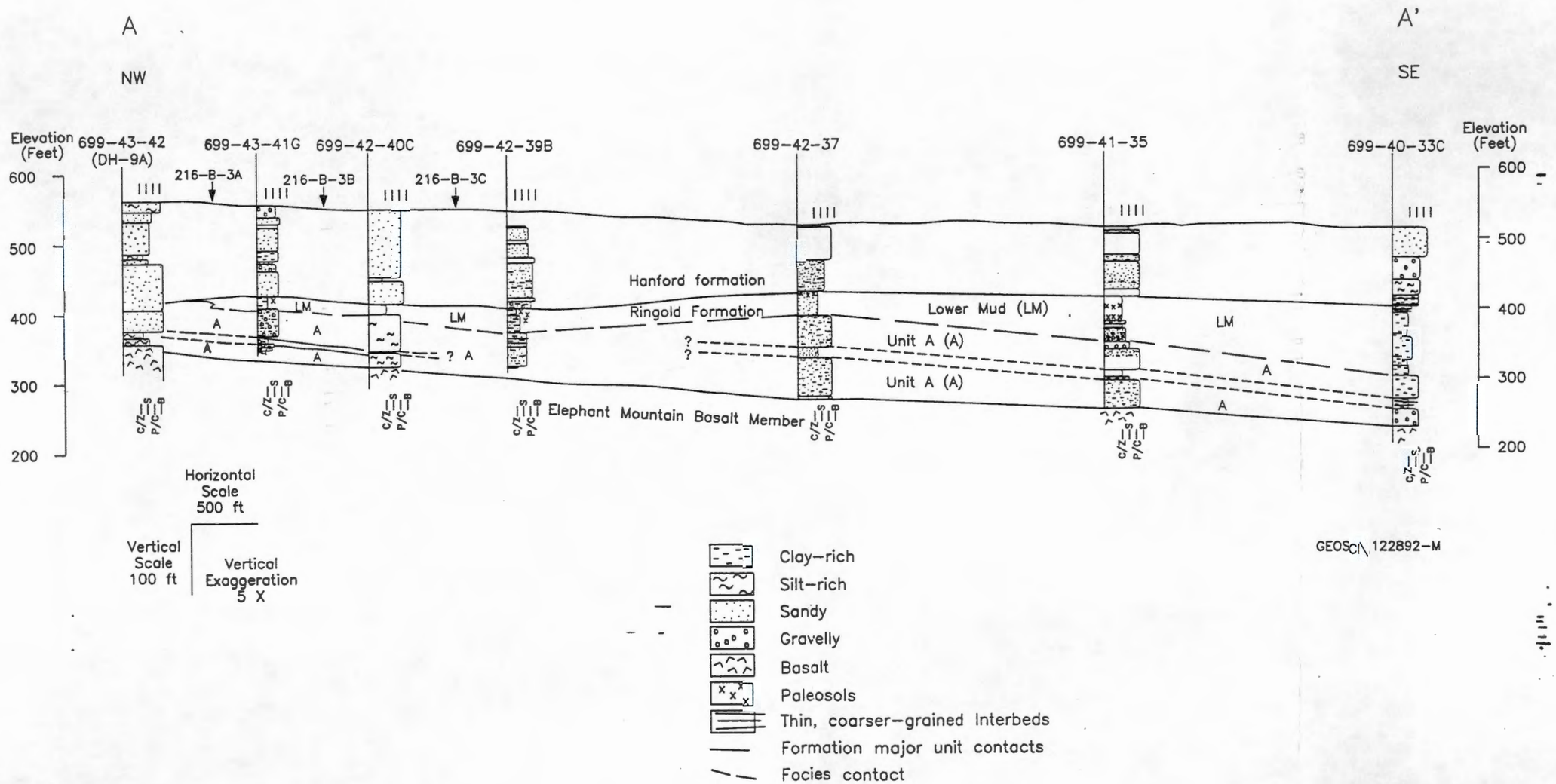

Figure 3. Stratigraphic Cross-section of the W-049H Treated Effluent Disposal Facility Site.

In the area of the candidate site, regional groundwater flow is generally from the north-west. Because of the mounding of the water table beneath the B Pond complex, groundwater in the uppermost aquifer locally has diverged from its natural flow path. December 1992 groundwater elevations for the uppermost aquifer in the TEDF site area are shown in Figure 4. The water table map indicates that the hydraulic gradient in the vicinity of the TEDF site is 0.002 and that the direction of groundwater flow is to the south-southeast.

The following sections discuss the hydrogeologic conditions at each of the three test wells. Hydrogeologic information was collected during drilling of these wells in the fall of 1992. Geologic well summary sheets of the wells are provided in Appendix A.

2.1 TEST WELL 699-40-36

Test well 699-40-36 is completed in the uppermost aquifer, which is locally confined in the vicinity of the TEDF site. Stratigraphic units encountered include the gravel facies of the Hanford formation, the LM sequence and unit A of the Ringold Formation, and the Elephant Mountain Basalt Member (Figure 3). The Hanford/Ringold LM contact is at 113 ft below ground surface. The LM sequence is approximately 85 ft thick and locally confines the saturated Ringold unit A. Approximately 2 ft of perched water occurs above the LM sequence at this well. The saturated thickness of the Ringold unit A is 75 ft and includes a 23-ft thick fine grained facies. The potentiometric head is located approximately at the Hanford/Ringold contact. The Elephant Mountain Member was encountered at 273 ft below ground surface.

2.2 TEST WELL 699-41-35

Test well 699-41-35 is completed in the uppermost aquifer, which is locally confined in the vicinity of the TEDF site. Stratigraphic units encountered include the gravel facies of the Hanford formation, the LM sequence and unit A of the Ringold Formation, and the Elephant Mountain Basalt Member (Figure 3). The Hanford/Ringold LM contact is 101 ft below ground surface. The LM sequence is approximately 73-ft thick and locally confines the saturated Ringold Unit A. The saturated thickness of the Ringold unit A is 73 ft and includes a 20-ft thick fine grained facies. The potentiometric head is located approximately at the Hanford/Ringold contact. The Elephant Mountain Member was encountered at 247 ft below ground surface.

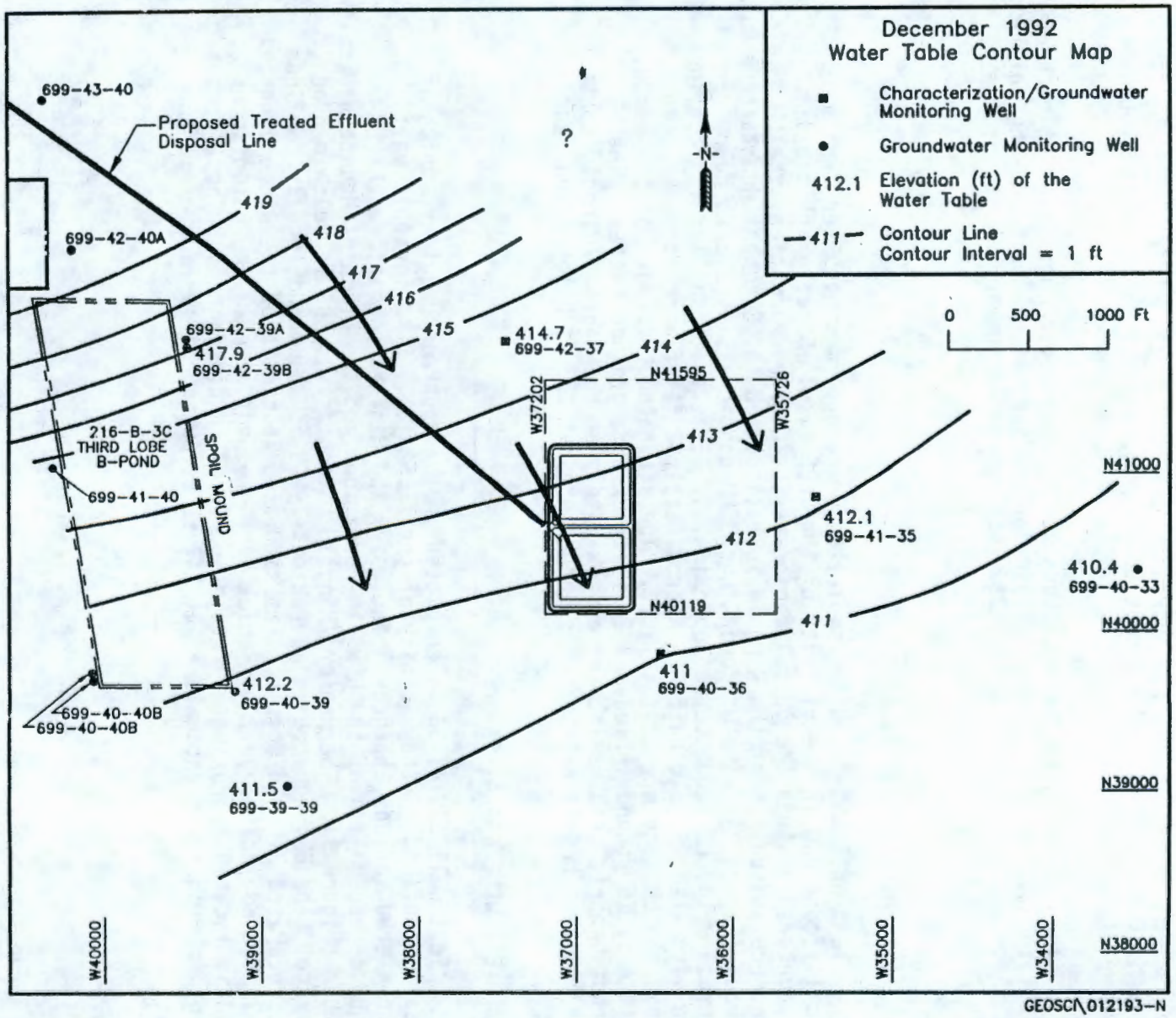

Figure 4. December 1992 Water Table Contour Map.

2.3 TEST WELL 699-42-37

Test well 699-42-37 is completed in the uppermost aquifer, which is locally confined in the vicinity of the TEDF site. Stratigraphic units encountered include the gravel facies of the Hanford formation, the LM sequence and unit A of the Ringold Formation, and the Elephant Mountain Basalt Member (Figure 3). The Hanford/Ringold LM contact is 92 ft below ground surface. The LM sequence is approximately 37 ft thick and locally confines the saturated Ringold Unit A. The saturated thickness of the Ringold Unit A is 136 ft thick and includes a 15-ft thick fine grained facies. The potentiometric head is located approximately at the Hanford/Ringold contact. The Elephant Mountain Member was encountered at 265 ft below ground surface.

3.0 WELL CONSTRUCTION

Test wells 699-40-36, 699-41-35, and 699-42-37 are completed in the uppermost part of the aquifer. Each well was constructed with 4-in. stainless steel casing, with a 10.3 ft, 10-slot continuous-wire-wrap stainless steel screen. A 20-40 sand filter pack was used at each of the three wells. Appendix A contains construction details for the three test wells.

4.0 PRETEST ANALYSIS

Preliminary hydrologic testing was conducted in the uppermost aquifer at wells 699-40-36, 699-41-35, and 699-42-37 after drilling and construction of the wells were completed. Instantaneous slug injection/withdrawal tests were conducted and drawdown data were collected in each well during well development. All tests were conducted in the saturated Ringold fluvial gravel unit A.

Aquifer test analyses are summarized in Table 1. The estimated values of hydraulic conductivity range from 1.3 to 2.7 ft/day. Slug injection/ withdrawal data and well development data are presented in Appendix B.

Table 1. W-049H TEDF Test Well Data.

Parameters	699-40-36	699-41-35	699-42-37
Casing Diameter (in)	4	4	4
Screen Diameter (in)	4	4	4
Screen Slot Size	10	10	10
Screened Length (ft)	10.3	10.3	10.3
Screened Interval (ft bgs)	209.2-219.5	189.8-200.1	144.2-154.5
Available Drawdown (ft)	101.3	93.3	49.7
Hydraulic conductivity based on slug analysis (ft/day)	1	2	3
Development Data Q(gpm)/Drawdown(ft)/Time(min)	.75/25/100	13/70/100	5.7/20/100

The slug injection/withdrawal analyses were conducted using the Bouwer and Rice method (1976). Assumptions inherent to Bouwer and Rice include: (1) drawdown of the water table is negligible, (2) vadose zone flow contribution is negligible, (3) head losses due to the well are negligible, and (4) the aquifer is homogeneous and isotropic in the area influenced by the test. Although the method assumes a water table aquifer, the method is applicable to situations in which the upper boundary of the aquifer is an impermeable or semipermeable confining layer.

5.0 TEST REQUIREMENTS

A pressure transducer data logger system is to be used to monitor changes in water levels during testing. The water level in each well will be measured prior to testing to determine the baseline condition. Water levels will subsequently be measured in each well for the duration of each test.

Based on existing well development data, predictions were made to estimate test flow rates and drawdown responses for the three test wells. The duration of each pumping test to be conducted will depend on the water level response and the pumping rate. Table 2 shows the predicted initial conditions for conducting a constant discharge test in each of the three wells. Based on initial aquifer responses after the tests are started, the well-site hydrogeologist is to have the option to change the initial parameters to better correspond to field conditions.

Table 2. Initial Test Conditions.

Wells	699-40-36	699-41-35	699-42-37
Discharge rate (gpm)	0.5	13	6
Test duration (hr)	4	4	4
Predicted drawdown (ft)	25-30	70	20

5.1 PUMP SELECTION

The constant discharge pump to be used for each test will depend on the required discharge rate. Several pump models are available from Westinghouse Hanford Company (WHC) Geosciences group including the Grunfros Redi-flo2 (a trademark of Grunfros Pumps Corp.) and the Grunfros submersible pump. The discharge rate for the Redi-flo2 model ranges from 0 to 6 gal/min. The discharge rate for the submersible pump ranges from 1 to 14 gal/min.

5.2 WELL CONFIGURATION

A Hydrostar (a trademark of Instrumentation Northwest) sampling pump is currently installed in each well. Each Hydrostar will be removed before the constant discharge test is conducted. The constant discharge pumps will then be temporarily installed. The completed wells will not require any other

modifications. After a constant discharge test is conducted in each well, the temporary pump will be removed and the Hydrostar sampling pump will be reinstalled.

5.3 EQUIPMENT REQUIREMENTS

Environmental Investigation Instructions (EII) 10.1 "Aquifer Testing" (WHC 1988), describes the data logger, transducer operation and recording frequencies to be used during the tests. The transducer is to be located as close to the screened interval as possible to permit the maximum available drawdown. Field calibrated flow meters will be used to monitor the discharge rates. Field calibration will be conducted by recording the time needed to fill a known volume with water. Flow rates will be recorded as required by EII 10.1. EII 10.1 also requires a step-drawdown test in order to estimate an optimal discharge rate during testing. However, because an optimum discharge rate was already estimated from well development data, a step-drawdown test will not be performed.

5.4 DISCHARGE RATES AND TEST DURATION - PUMPING PHASE

Estimated discharge rates for tests in each of the three wells are shown in Table 2. The rates were estimated based on existing well development data. The field hydrogeologist may adjust the discharge rate after the test has begun, once actual field conditions are observed. If the discharge rate is adjusted after initiation of the test, a baseline may have to be re-established.

The tests are to be run until an approximately semi-steady state condition is established; i.e., the rate of change on a semi-log plot becomes constant. The duration of each of the three tests is predicted to be at least 4 hr. It is anticipated that the tests will not require longer than 8 hr. If boundary conditions are encountered during any test, the test will continue until the effect is clearly delineated. The time vs. drawdown response for the pumping well will be plotted in the field on semi-log paper. Based on the field data, the well-site hydrogeologist will determine the end of each test.

5.5 BOREHOLE STORAGE

Borehole storage effects are predicted to dissipate early in the constant discharge test. The time for dissipation will depend on the aquifer transmissivity. Weeks (1977) provides a criterion for estimating the duration period over which wellbore storage will influence drawdown:

$$t > 25\ r_c^2/T$$

where: r_c = radius of well casing (L), and
T = transmissivity (L^2/T)

After this period of time has passed, observed drawdown should approximate the applicable type of drawdown response curve. Using this equation to estimate

borehole storage, observable effects are anticipated to dissipate in approximately 10 to 30 minutes in each of the three wells.

5.6 CONSTANT DISCHARGE RECOVERY PHASE

The recovery portion of the constant discharge test will begin once the pump is turned off by the well-site hydrogeologist. The frequency for measuring water levels will be the same as for the pumping phase of the test. The duration of recovery will continue until the water level has returned to at least 90% of the static water level.

5.7 ANALYTICAL METHODS

The methods used to analyze the data collected from the constant discharge and recovery tests will depend on the shape and type of drawdown response curve observed. Potential methods of analysis include Jacob-Cooper (1956) and Neuman (1975).

6.0 PURGEWATER REQUIREMENTS

Purgewater generated at the three test wells will be disposed to the ground in the immediate vicinity of the well head. This purgewater determination was made by the geosciences group based on groundwater quality analyses collected from the three test wells (see Appendix C). Estimated volumes of generated purgewater for wells 699-40-36, 699-41-35, and 699-42-37 are 240 gal, 3,120 gal, and 1,440 gal.

7.0 PROCEDURES AND DOCUMENTATION

Test documentation and procedural control are covered by this test plan and EII 10.1 (WHC 1988). Field conditions may warrant deviations to EII 10.1. Any deviations from the procedures will be noted on the field activity report and approved in advance via interim change authorization (ICA) or Engineering Change Notice (ECN) as applicable.

8.0 QUALITY ASSURANCE

Quality assurance (QA) is addressed under the QA Project Plan as contained in Davis and Delaney (1992). Data Quality is controlled by this test plan and EII 10.1. Variations from EII 10.1 or this test plan may be warranted because of unexpected hydrogeologic conditions. Any deviation from EII 10.1 or the test plan must be approved in advance via ICA or ECN.

9.0 RESPONSIBILITIES

Specific responsibilities for the test activities are described in EII 10.1. Personnel assigned to the each test activity will be identified by the field activity report. Overall responsibilities, by organization, are detailed in Davis and Delaney (1992).

10.0 HEALTH AND SAFETY

The current site safety plan prepared by Kaiser Engineers Hanford (KEH) for the TEDF site will be used for hydrologic field testing. Because the TEDF is not a hazardous waste site, field activities will be conducted in Level D personal protective equipment.

11.0 REPORT

Results from aquifer testing at the TEDF site will be included in Davis and Delaney (1992). The site characterization report is to be completed by August 31, 1993, and will be transmitted to the State of Washington Department of Ecology.

12.0 SCHEDULE

Aquifer testing and analysis is scheduled to be completed by March 31, 1993, as stated in the *W-049H - 200 Areas Treated Effluent Disposal Basin Site Characterization Work Plan* (Davis and Delaney, 1992).

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APPENDIX A

WELL SUMMARY SHEETS FOR 699-40-36, 699-41-35, AND 699-42-37

WHC-SD-EN-TP-025, Rev. 0

WELL SUMMARY SHEET

Boring or Well No. 699-40-36

Sheet 1 of 2

Location: 200 Areas TEDB Candidate site

Project: W049H

Elevation: 525.79'

Drilling Contractor: KEH

Driller: M. Wadspir

Drilling Method and Equipment: Cable Tool

Prepared By: Keith J. Swett [illegible] Date: 8/21/92 (Sign/Print Name)

Reviewed By: Edward C. Rafuse [illegible] Date: 10/25/92 (Sign/Print Name)

CONSTRUCTION DATA		Depth in Feet	GEOLOGIC/HYDROLOGIC DATA	
Description	Diagram		Graphic Log	Lithologic Description
Cement grout 2.0-9.8 Ft.				0-4' SAND
12" C.S. Temp. Casing				4-7' Silty Sandy GRAVEL
set @ 22.33'		10		GRAVEL
shoe size 1.12' ϕ				"
		20		"
				"
		30		"
				"
		40		"
Bentonite Crumbels				"
9.8 - 96.0 Ft		50		"
				"
		60		"
				"
		70		"
				"
		80		"
				"
		90		"
				"
Hole Plug (Coarse Granular		100		"
Bentonite) 96.0-203.6 Ft.				"
SWL @ 115.2 on 10/20/92		110		"
				113' - silty CLAY to Clayey SILT
10" C.S. Temp. Casing		120		120' - Clayey SILT
set @ 117.59'				" "
shoe size 0.95' ϕ		130		" "
				" "
		140		" "
				" "
		150		" "
				Interbedded sand lenses <1' @ ≈
				152.5' & 154.0'
		160		Water contact 152.5'

A-6000-384 (04/90)

WELL SUMMARY SHEET

WHC-SD-EN-TP-025, Rev. 0

Boring or Well No. 699-40-36

Sheet 2 of 2

Location 200 AREA TEDB Candidate Site

Project W049H

Elevation ~~[illegible]~~ 1-7-93 525.79'

Drilling Contractor KEH

Driller M. Wraspir

Drilling Method and Equipment Cable Tool B.E. 22W

Prepared By Stewart Causey / Stewart Causey (Sign/Print Name) Date 10/2/92

Reviewed By Edward C. Rafuse / Edward C. Rafuse (Sign/Print Name) Date 10/25/92

CONSTRUCTION DATA: Description	Diagram	Depth in Feet	GEOLOGIC/HYDROLOGIC DATA: Graphic Log	Lithologic Description
Hole plug (coarse granular Bentonite) 96.0 - 203.6 Ft		170		Clayey SILT
				" "
		180		" "
				" "
		190		Silty CLAY
				Slightly Gravelly Silty CLAY
		200		~~GRAVEL~~ @≈197.5' GSC 10/12/92
20-40 sand Filter Pack 203.6 - 223.2 Ft				Sandy GRAVEL
		210		" "
				" "
4" Ø .010 slot continuous wire wrap stainless steel screen 209.24 - 219.51 Ft.		220		" "
				" "
		230		Silty CLAY @ ≈ 227'
				" "
		240		" "
				" "
				" "
8" C.S. Temp. Casing set @ 260.89'		250		Silty sandy GRAVEL @≈250'
				" " "
		260		Sandy GRAVEL @ ≈ 265'
Hole plug (coarse granular Bentonite) 223.2 - 278.0 Ft.				" "
		270		272 FT BASALT
				"
		275		"
Slough 280.0 - 278.0		280		T.D. 280'

A-6000-384 (04/90)

WHC-SD-EN-TP-025, Rev. 0

WELL SUMMARY SHEET

Boring or Well No. 699-41-35

Sheet 1 of 2

Location: 200 Areas TEDB candidate site

Project: W049H

Elevation: 517' ground elevation

Drilling Contractor: KEH

Driller: L. Watkins

Drilling Method and Equipment: Cable Tool: Bucyrus Erie 22W

Prepared By: Keith J. Swett (Sign/Print Name) Date: 10/05/92

Reviewed By: Edward C. Rafuse (Sign/Print Name) Date: 10/16/92

CONSTRUCTION DATA		Depth in Feet	GEOLOGIC/HYDROLOGIC DATA	
Description	Diagram		Graphic Log	Lithologic Description
				0-3' SAND
Cement Grout 2.0 - 9.0 Ft		10		3-7' Silty Sandy GRAVEL
				GRAVEL
12"ϕ Temporary CS casing		20		"
w/drive shoe set at				"
19.40 Ft		30		"
				"
				"
		40		
Bentonite crumbles				Silty Sandy GRAVEL
9.0 - 97.6 Ft		50		"
				Sandy GRAVEL
		60		"
				"
10"ϕ Temporary CS casing		70		"
w/drive shoe set at				"
120.56 Ft		80		Silty Sandy GRAVEL
				Sandy GRAVEL
		90		GRAVEL
				"
				"
SWL @ 105.8 on 10/5/92		100		
Hole Plug (Coarse Granular				101.3' SILT Potentiometric
Bentonite) 97.6 - 183.5 Ft		110		" surface of confined
				" aquifer @ 105.75 Ft.
		120		"
				SILT w/ increasing CLAY
8"ϕ Temporary CS casing		130		SILT / CLAY
w/drive shoe set at				"
246.82 Ft		140		Clayey Silty SAND
				SILT / CLAY
		150		Sandy CLAY / Clayey SAND
				Slightly Clayey SAND
		160		Slightly Sandy CLAY
				Slightly Clayey SAND

A-6000-384 (04/90)

WELL SUMMARY SHEET

Boring or Well No. 699-41-35

Sheet 2 of 2

Location 200 Areas TEDB Candidate Site

Project WOUGH

Elevation 517' ground elevation

Drilling Contractor KEH

Driller L. Watkins

Drilling Method and Equipment Cable Tool Bucyrus Erie 22W

Prepared By Keith J. Swett (Sign/Print Name) Date 10/8/92

Reviewed By Edward C. Rafuse (Sign/Print Name) Date 10/8/92

CONSTRUCTION DATA		Depth in Feet	GEOLOGIC/HYDROLOGIC DATA	
Description	Diagram		Graphic Log	Lithologic Description
Hole Plug (Coarse Granular Bentonite) 97.6 - 183.5 Ft		170		SAND
				174' Gravelly Silty SAND
		180		Silty Sandy GRAVEL
20-40 Sand Filter Pack 183.5 - 201.9 Ft				"
				186' GRAVEL
		190		"
4"ϕ .010 slot continuous wire wrap stainless steel screen 189.81 - 200.11 Ft				"
		200		203' CLAY
				"
		210		215'-215.5' SAND
8"ϕ Temporary CS casing w/drive shoe set at 246.82 Ft				CLAY
		220		223' GRAVEL
				"
		230		Silty Sandy GRAVEL
Hole Plug (Coarse Granular Bentonite) 201.9 - 256.4 Ft		240		"
				"
		250		247' BASALT
				"
Slough 256.4 - 260.0 Ft		260		"
				TD = 260.00 Ft

A-6000-384 (04/90)

WHC-SD-EN-TP-025, Rev. 0

WELL SUMMARY SHEET

Boring or Well No. 699-42-37

Sheet 1 of 2

Location 200 Areas TEDB Candidate Site

Project W049H

Elevation ~~N/A~~ 1-6-93 516.18'

Drilling Contractor KEH

Driller M. Wrasp'r

Drilling Method and Equipment Cable Tool: BE22W

Prepared By K.J. Swett (Sign/Print Name) Date 9-1-92 10-24-92

Reviewed By (Sign/Print Name) Date 10/29/92

CONSTRUCTION DATA		Depth in Feet	GEOLOGIC/HYDROLOGIC DATA	
Description	Diagram		Graphic Log	Lithologic Description
				0-2' SAND
CEMENT GROUT 2.0-8.1 ft.		10		2-48 GRAVEL
				"
		20		"
12"ϕ Temporary CS casing w/shoe set at 21.69 FT				"
		30		"
				"
		40		"
BENTONITE CHUNKS 8.1 - 88.5 Ft.				48.5-92 Silty Sandy GRAVEL
		50		"
		60		"
		70		"
		80		"
HOLE PLUG (COARSE GRANULAR BENTONITE) 88.5 - 139.6		90		92'-95 Silt/Clay paleosol
SWL 101.2 Ft. ON 10-19-92		100		95 - Sandy Silt Clay (95'-129')
		110		"
10"ϕ Temporary C.S. casing w/shoe set at 121.93'		120		"
		130		(129' to 176') Silty Sandy Gravel
20-40 SAND FILTER PACK 139.6'-159.9'		140		"
4"ϕ .010 SLOT CONTINUOUS WIRE WRAP STAINLESS STEEL SCREEN 144.23 - 154.50 Ft.		150		"
		160		"

A-5

A-6000-384 (04/90)

WELL SUMMARY SHEET

Boring or Well No. 399-42-37

Sheet 2 of 2

Location 200 Areas TEDB Candidate site
Project W049H
Elevation 516.18'
Drilling Contractor KEH
Driller M. Wraspir
Drilling Method and Equipment Cable Tool: BE22W
Prepared By K. J. Swett [signature] (Sign/Print Name) Date 10-24-97
Reviewed By Edward C. Rafuse [signature] (Sign/Print Name) Date 12/08/92

CONSTRUCTION DATA		Depth in Feet	GEOLOGIC/HYDROLOGIC DATA	
Description	Diagram		Graphic Log	Lithologic Description
8"Ø Temporary CS casing w/shoe set at 258.09 FT		170		(129'-176') silty sandy GRAVEL
				"
		180		(176' to 191') Sandy silty CLAY
				"
		190		"
				(191' to 245') silty sandy GRAVEL
		200		"
				"
		210		"
Hole Plug (coarse granular bentonite) 159.9-263.5'				"
		220		"
				"
		230		"
				"
		240		"
				"
		250		(245'-248.5') Sandy GRAVEL
				(248.5' to 265.5') weathered BASALT
		260		265.5' BASALT
slough 268.0'-263.5'		270		TD = 268.00 FT

A-6000-384 (04/90)

APPENDIX B

INSTANTANEOUS SLUG INJECTION/WITHDRAWAL ANALYSIS

Well Number: 699-40-36

Dimensions in ft unless otherwise specified

Project: W-049H TEDF

Date of Test: 12/01/92

Type of Test: Slug injection

Slugging Rod Dimensions, L: 6.0

D: .167

Theorectical head displacement in 4 inch casing: 1.57

Location of Field Records and Data: RCRA Records File

Head change within screened interval: NO

Depth below land surface/top of 6" of tested zone: 219.84 209.57 - 219.84

Radius of casing, Rc: .167

Radius of well, Rw: .333

Distance from WT to bottom of tested interval, Lw: 105.1

Length of saturated screen interval, Le: 10.27

Thickness of aquifer, H: 119.5

Estimated Porosity of Sand Pack: .25

For Bouwer and Rice Analysis

Time correction applied to data (min): 0.150

Intial Head change, Yo: 1.83

Arbitrary time value on straight line, Tc (min): 3.2

Head at Tc, Yt: 1

Comments: SWL 114.05

Name (print): Signature: Date:

699-40-36

****

THE BELOW HYDRAULIC CONDUCTIVITY VALUE WAS CALCULATED
USING THE BOUWER AND RICE SLUG TEST METHOD.
SOURCE= "THE BOUWER AND RICE SLUG TEST-AN UPDATE"
GROUND WATER, VOL 27, NO. 3, MAY-JUNE 1989.

****

Rc (ft)	Rw (ft)	Le (ft)	Lw (ft)	H (ft)
.1670	.3330	10.2700	105.1000	119.5000

****

Le/Rw = 30.8408400
A= 2.5426880
B= 3.823192E-001
C= 2.1450520
t (min)= 3.0500000
1/t= 3.278688E-001
Yo= (ft) 1.8300000
Yt= (ft) 1.0000000
1/t ln(Yo/Yt)= 1.981364E-001
ln[(H-Lw)/Rw]= 3.7668410
ln(Re/Rw)= 3.1221210

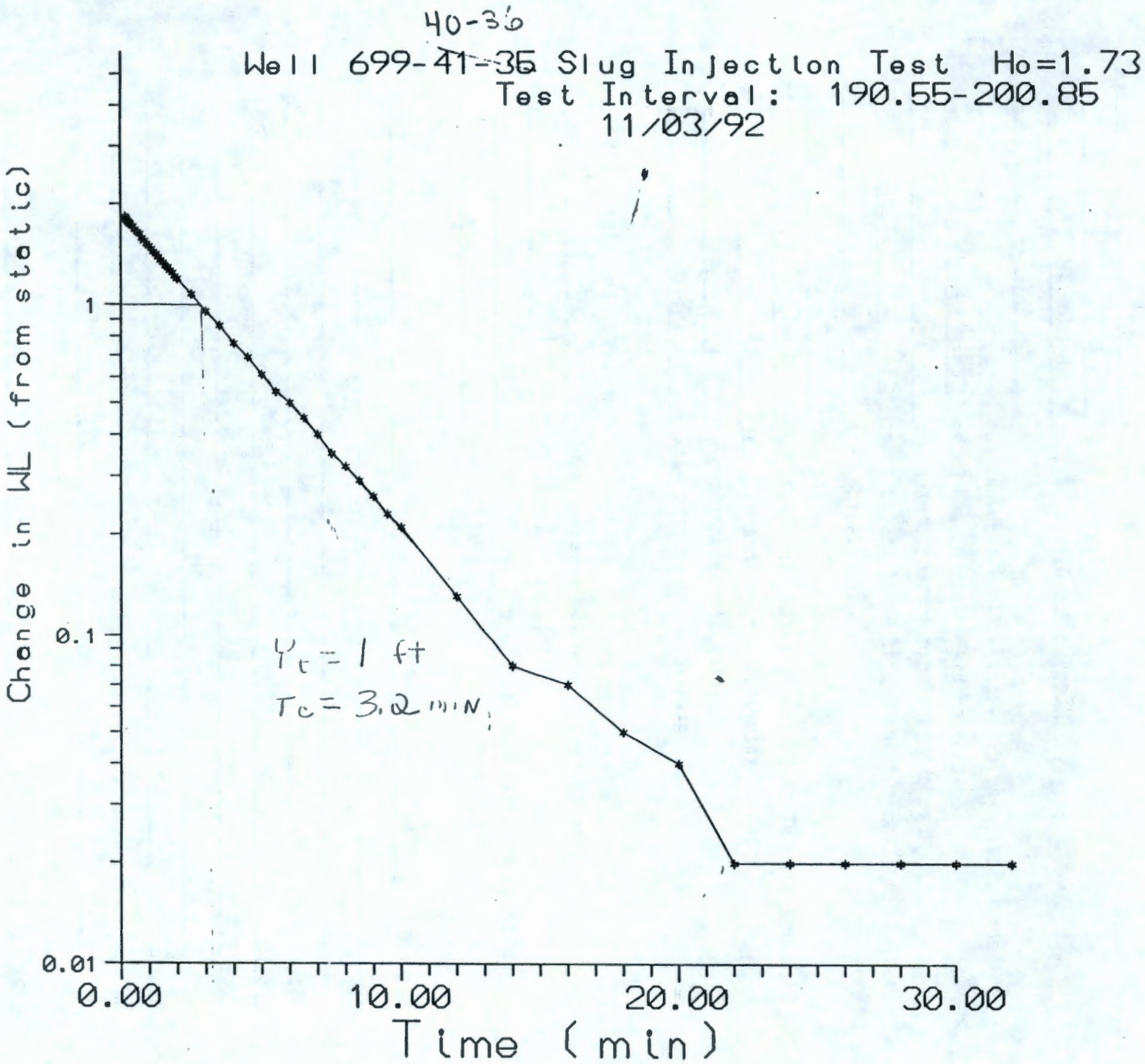
****

K (ft/day) = 1.2095080

****

T OF THE SATURATED SCREEN INTERVAL
(ft2/day)= 12.4216500

****


40-36
Well 699-41-35 Slug Injection Test Ho=1.73
Test Interval: 190.55-200.85
11/03/92
Change in WL (from static)
1
0.1
0.01
0.00
10.00
20.00
30.00
Time (min)
$Y_t = 1$ ft
$T_c = 3.2$ min

Well Number: 699-40-36

Dimensions in ft unless otherwise specified

Project: W-049H TEDF

Date of Test: 12/01/92

Type of Test: slug withdrawal

Slugging Rod Dimensions, L: 6.0

D: .167

Theorectical head displacement in 4 inch casing: 1.57

Location of Field Records and Data: RCRA Records File

Head change within screened interval: NO

Depth below land surface/top of 6" of tested zone: 219.84 209.57-219.84

Radius of casing, Rc: .167

Radius of well, Rw: .333

Distance from WT to bottom of tested interval, Lw: 105.1

Length of saturated screen interval, Le: 10.27

Thickness of aquifer, H: 119.5

Estimated Porosity of Sand Pack: .25

For Bouwer and Rice Analysis

Time correction applied to data (min): .033

Intial Head change, Yo: 1.94

Arbitrary time value on straight line, Tc (min): 3

Head at Tc, Yt: 1

Comments: SWL 118.05

Name (print): Signature: Date:

699-40-36

****

THE BELOW HYDRAULIC CONDUCTIVITY VALUE WAS CALCULATED
USING THE BOUWER AND RICE SLUG TEST METHOD.
SOURCE= "THE BOUWER AND RICE SLUG TEST-AN UPDATE"
GROUND WATER, VOL 27, NO. 3, MAY-JUNE 1989.

****

Rc (ft)	Rw (ft)	Le (ft)	Lw (ft)	H (ft)
.1670	.3330	10.2700	105.1000	119.5000

****

Le/Rw = 30.8408400
A= 2.5426880
B= 3.823192E-001
C= 2.1450520
t (min)= 3.0000000
1/t= 3.333333E-001
Yo= (ft) 1.9400000
Yt= (ft) 1.0000000
1/t ln(Yo/Yt)= 2.208960E-001
ln[(H-Lw)/Rw]= 3.7668410
ln(Re/Rw)= 3.1221210

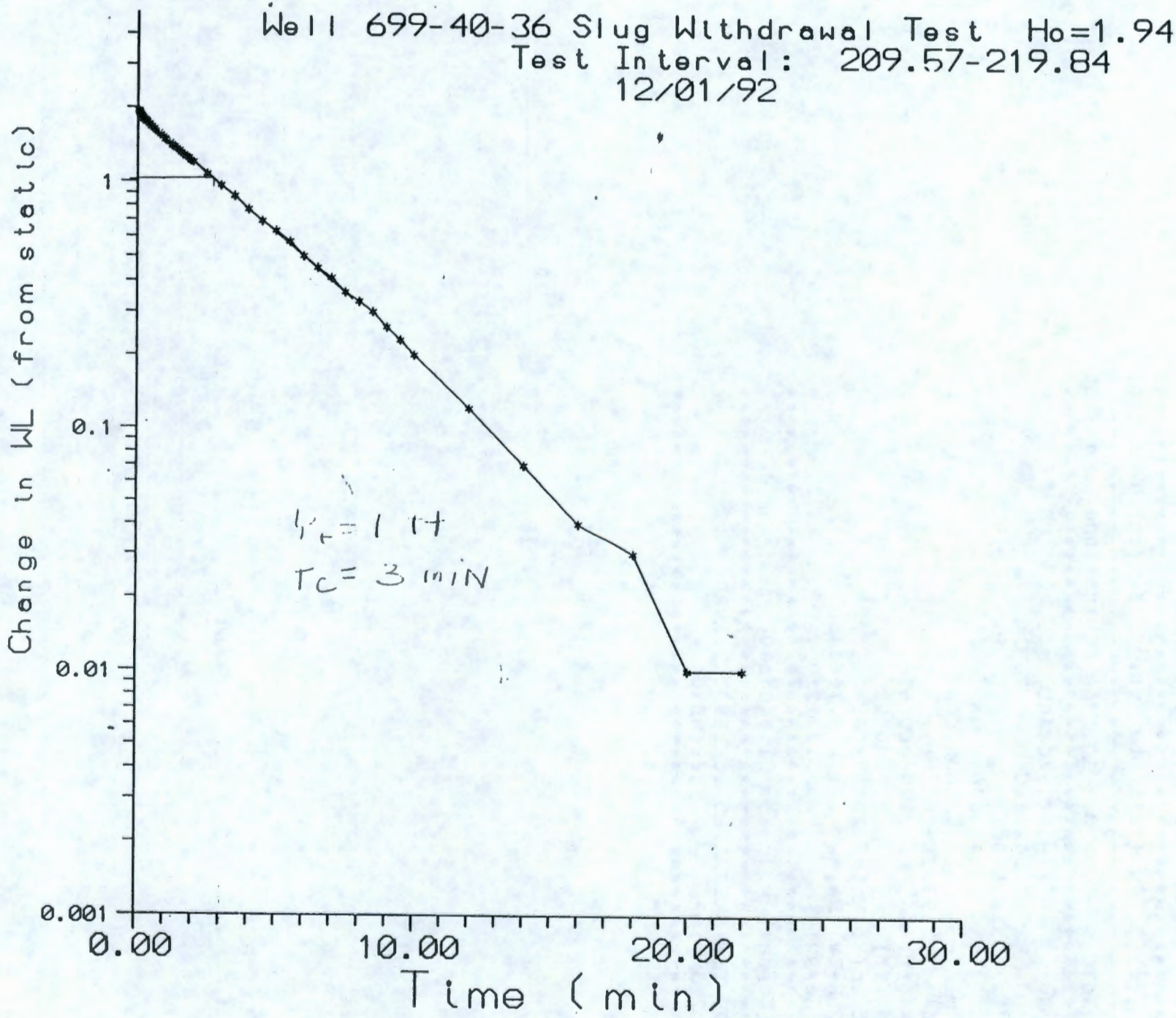
****

K (ft/day) = 1.3484430

****

T OF THE SATURATED SCREEN INTERVAL
(ft2/day)= 13.8485100

****


Well 699-40-36 Slug Withdrawal Test Ho=1.94
Test Interval: 209.57-219.84
12/01/92
Change in WL (from static)
1
0.1
0.01
0.001
0.00
10.00
20.00
30.00
Time (min)
Ho = 1 ft
Tc = 3 min

Well Number: 699-41-35

Dimensions in ft unless otherwise specified

Project: W-049H TEDF

Date of Test: 11/03/92

Type of Test: Slug injection

Slugging Rod Dimensions, L: 6.8

D: .167

Theoretical head displacement in 4 inch casing: 1.57

Location of Field Records and Data: RCRA Remand File

Head change within screened interval: no

Depth below land surface/top of 6" of tested zone: 200.85 190.55-200

Radius of casing, Rc: .167

Radius of well, Rw: .333

Distance from WT to bottom of tested interval, Lw: 95.6

Length of saturated screen interval, Lc: 10.3

Thickness of aquifer, H: 109

Estimated Porosity of Sand Pack: .25

For Bouwer and Rice Analysis

Time correction applied to data (min): .300

Intial Head change, Yo: 1.73

Arbitrary time value on straight line, Tc (min): 2.5

Head at Tc, Yt: 1

Comments: SWL 109.20

Name (print): Signature: Date:

699-41-35

****

THE BELOW HYDRAULIC CONDUCTIVITY VALUE WAS CALCULATED
USING THE BOUWER AND RICE SLUG TEST METHOD.
SOURCE= "THE BOUWER AND RICE SLUG TEST-AN UPDATE"
GROUND WATER, VOL 27, NO. 3, MAY-JUNE 1989.

****

Rc (ft)	Rw (ft)	Le (ft)	Lw (ft)	H (ft)
.1670	.3330	10.3000	95.6000	109.0000

****

Le/Rw = 30.9309300
A= 2.5426880
B= 3.823192E-001
C= 2.1450520
t (min)= 2.2000000
1/t= 4.545454E-001
Yo= (ft) 1.7300000
Yt= (ft) 1.0000000
1/t ln(Yo/Yt)= 2.491461E-001
ln[(H-Lw)/Rw]= 3.6948680
ln(Re/Rw)= 3.1033820

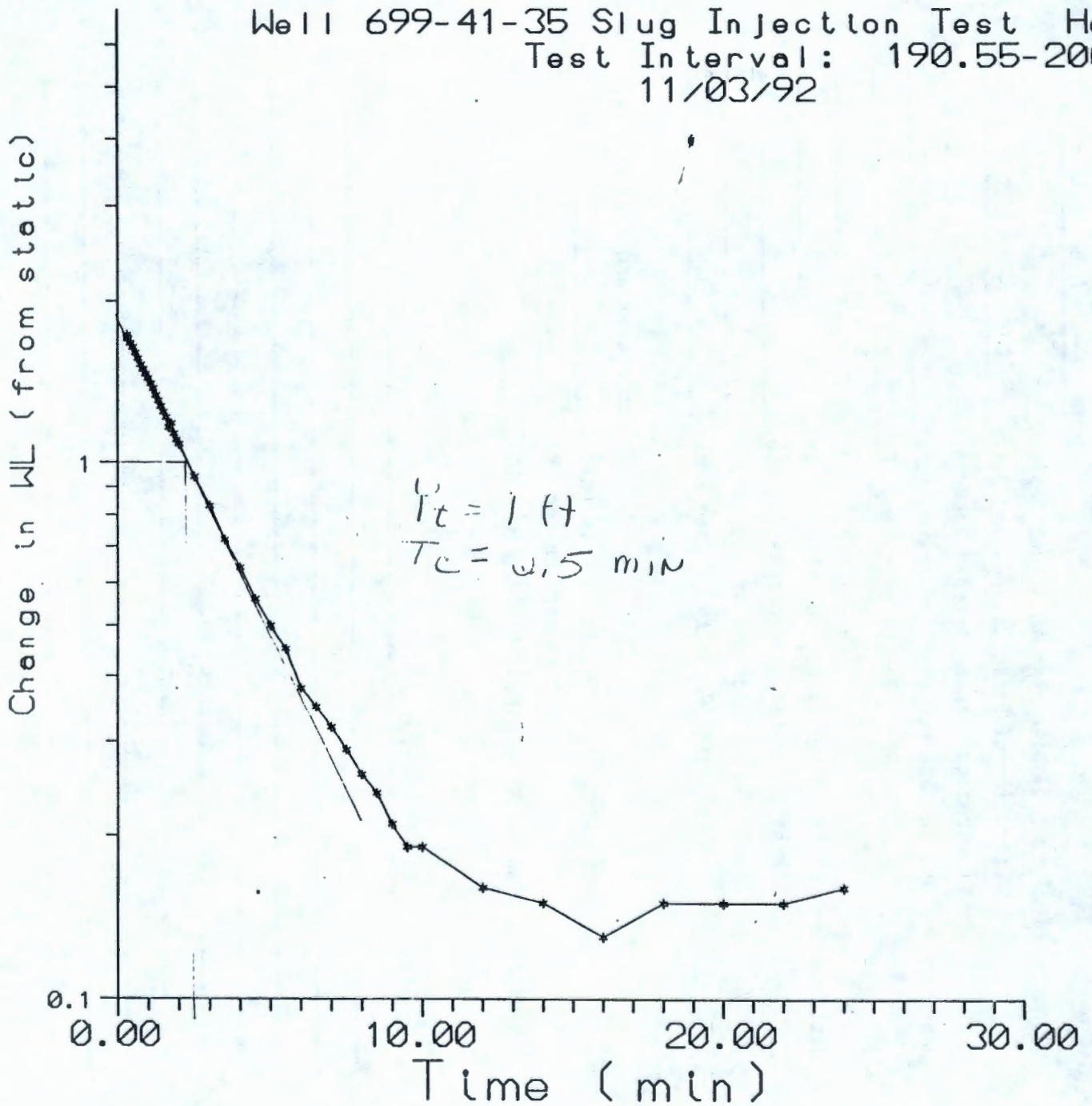
****

K (ft/day) = 1.5073620

****

T OF THE SATURATED SCREEN INTERVAL
(ft2/day)= 15.5258300

****


Well 699-41-35 Slug Injection Test Ho=1.73
Test Interval: 190.55-200.85
11/03/92
Change in WL (from static)
1
0.1
0.00
10.00
20.00
30.00
Time (min)
Ht = 1 ft
Tc = 0.5 min

Well Number: 699-41-35

Dimensions in ft unless otherwise specified

Project: W-049H TEDF

Date of Test: 11/03/92

Type of Test: Slug Withdrawal

Slugging Rod Dimensions, L: 6.0

D: .167

Theorectical head displacement in 4 inch casing: 1.57

Location of Field Records and Data: RCRA Records File

Head change within screened interval: no

Depth below land surface/top of 6" of tested zone: ≈200.85 190.55-200.85

Radius of casing, Rc: .167

Radius of well, Rw: .333

Distance from WT to bottom of tested interval, Lw: 95.6

Length of saturated screen interval, Le: 10.3

Thickness of aquifer, H: 109

Estimated Porosity of Sand Pack: .25

For Bouwer and Rice Analysis

Time correction applied to data (min): .03

Intial Head change, Yo: .38

Arbitrary time value on straight line, Tc (min): ≈.05

Head at Tc, Yt: 1

Comments: SWL 109.20

Name (print): Signature: Date:

699-41-35

****

THE BELOW HYDRAULIC CONDUCTIVITY VALUE WAS CALCULATED
USING THE BOUWER AND RICE SLUG TEST METHOD.
SOURCE= "THE BOUWER AND RICE SLUG TEST-AN UPDATE"
GROUND WATER, VOL 27, NO. 3, MAY-JUNE 1989.

****

Rc (ft)	Rw (ft)	Le (ft)	Lw (ft)	H (ft)
.1670	.3330	10.3000	95.6000	109.0000

****

Le/Rw = 30.9309300
A= 2.5426880
B= 3.823192E-001
C= 2.1450520
t (min)= 2.0200000
1/t= 4.950495E-001
Yo= (ft) 1.8800000
Yt= (ft) 1.0000000
1/t ln(Yo/Yt)= 3.125108E-001
ln[(H-Lw)/Rw]= 3.6948680
ln(Re/Rw)= 3.1033820

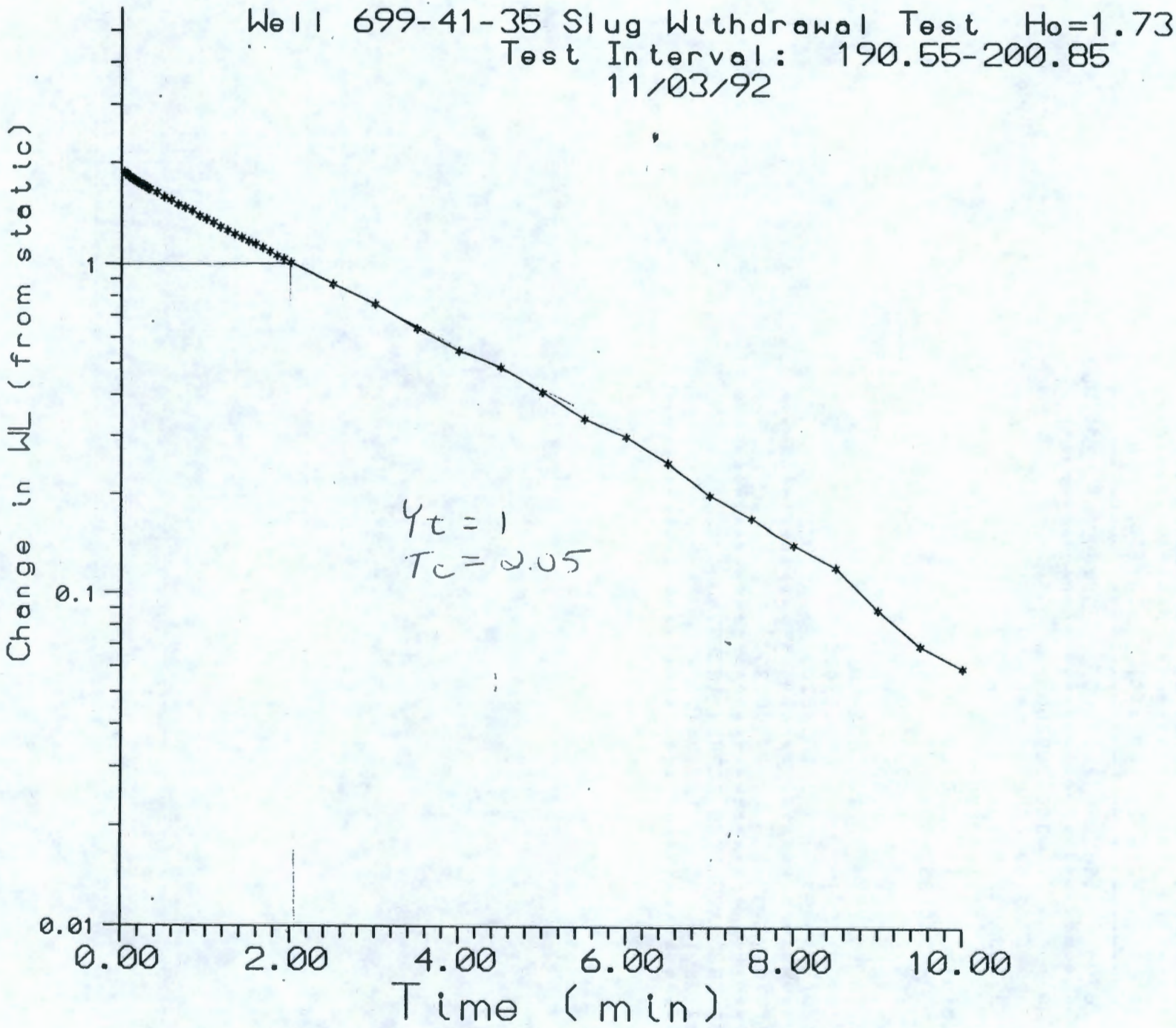
****

K (ft/day) = 1.8907250

****

T OF THE SATURATED SCREEN INTERVAL
(ft2/day)= 19.4744700

****


Well 699-41-35 Slug Withdrawal Test Ho=1.73
Test Interval: 190.55-200.85
11/03/92
Change in WL (from static)
1
0.1
0.01
0.00
2.00
4.00
6.00
8.00
10.00
Time (min)
Yt = 1
Tc = 2.05

Well Number: 699-42-37

Dimensions in ft unless otherwise specified

Project: W-049H TEDF

Date of Test: 10/30/92

Type of Test: Slug [illegible]

Slugging Rod Dimensions, L: 6.0 v = .13 ft³

D: .167

Theorectical head displacement in 4 inch casing: 1.57

Location of Field Records and Data: RCRA Records File

Head change within screened interval: no screened I 144.9-155

Depth below land surface/top of 6" of tested zone: 155.1

Radius of casing, Rc: .167

Radius of well, Rw: .333

Distance from WT to bottom of tested interval, Lw: 53.7

Length of saturated screen interval, Le: 10.3

Thickness of aquifer, H: 144.5

Estimated Porosity of Sand Pack: .25

For Bouwer and Rice Analysis

Time correction applied to data (min): 0.100

Intial Head change, Yo: 1.92

Arbitrary time value on straight line, Tc (min): 1.3

Head at Tc, Yt: 1

Comments: Cooper curve did not strictly fit. Theoretical head displacement was lower than actual [illegible] + 24 - .3 ft.

Name (print): Signature: Date:

699-42-37

****

THE BELOW HYDRAULIC CONDUCTIVITY VALUE WAS CALCULATED
USING THE BOUWER AND RICE SLUG TEST METHOD.
SOURCE= "THE BOUWER AND RICE SLUG TEST-AN UPDATE"
GROUND WATER, VOL 27, NO. 3, MAY-JUNE 1989.

****

Rc (ft)	Rw (ft)	Le (ft)	Lw (ft)	H (ft)
.1670	.3330	10.3000	53.7000	144.5000

****

Le/Rw = 30.9309300
A= 2.5426880
B= 3.823192E-001
C= 2.1450520
t (min)= 1.3000000
1/t= 7.692308E-001
Yo= (ft) 1.9200000
Yt= (ft) 1.0000000
1/t ln(Yo/Yt)= 5.017886E-001
ln[(H-Lw)/Rw]= 5.6082720
ln(Re/Rw)= 2.7178900

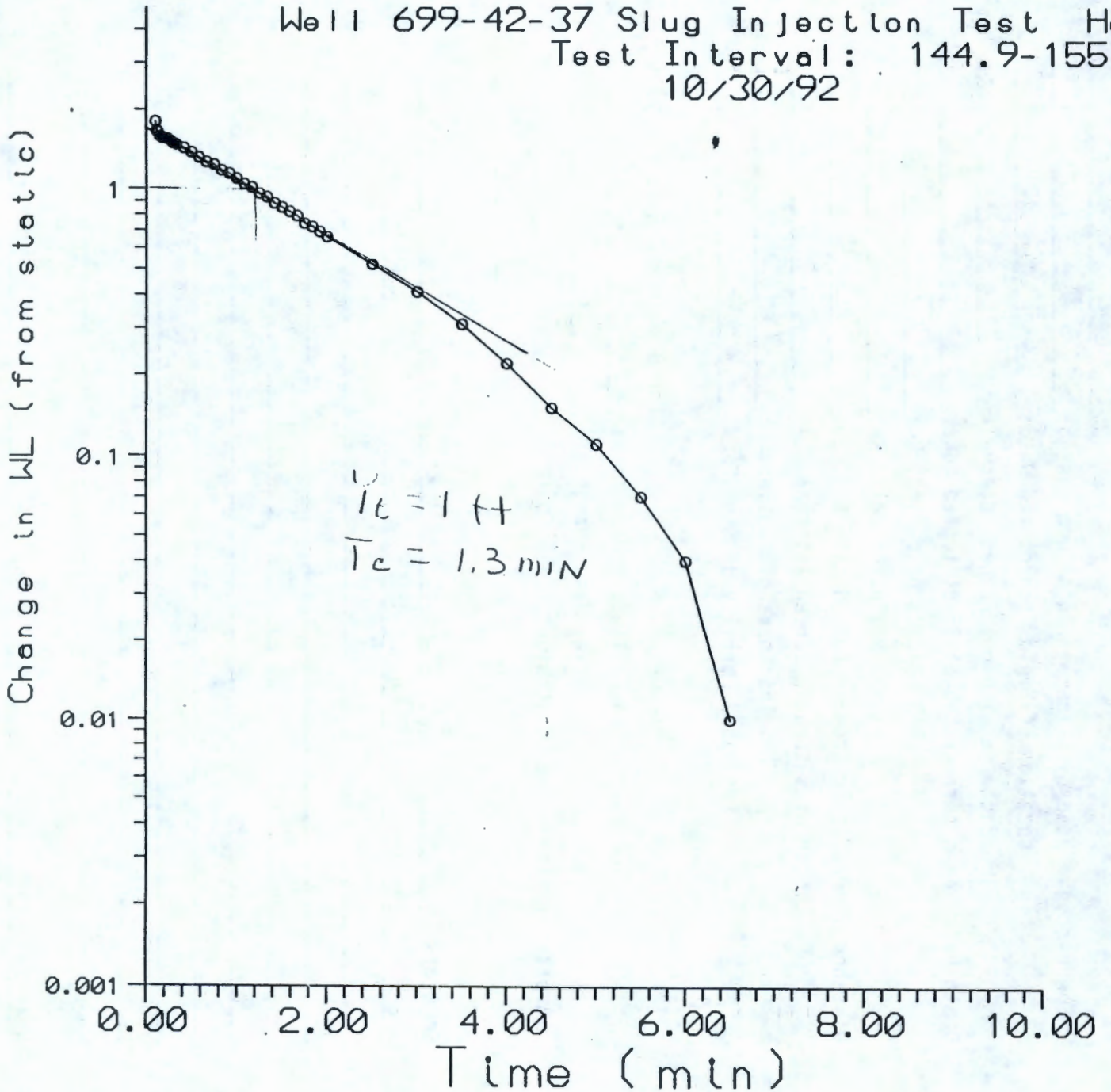
****

K (ft/day) = 2.6587710

****

T OF THE SATURATED SCREEN INTERVAL
(ft2/day)= 27.3853400

****


Well 699-42-37 Slug Injection Test Ho=1.92
Test Interval: 144.9-155.2
10/30/92
Change in WL (from static)
1
0.1
0.01
0.001
0.00
2.00
4.00
6.00
8.00
10.00
Time (min)
Ic = 1 ft
Tc = 1.3 min

Well Number: 699-42-37

Dimensions in ft unless otherwise specified

Project: W-049H TEDF

Date of Test: 10/30/92

Type of Test: Slug Withdrawal

Slugging Rod Dimensions, L: 6.8 V=.13 ft3

D: .167

Theorectical head displacement in 4 inch casing: 1.57

Location of Field Records and Data: RCRA Records File

Head change within screened interval: no

Depth below land surface/top of 6" of tested zone: 155.1 Screened interval 144.9-155.

Radius of casing, Rc: .167

Radius of well, Rw: .333

Distance from WT to bottom of tested interval, Lw: 53.7

Length of saturated screen interval, Le: 10.3

Thickness of aquifer, H: 144.5

Estimated Porosity of Sand Pack: .25

For Bouwer and Rice Analysis

Time correction applied to data (min): .03

Intial Head change, Yo: 1.90

Arbitrary time value on straight line, Tc (min): 1.5

Head at Tc, Yt: 1

Comments: Cooper Curve did not fit the upper and lower 1/3rd of the data

Name (print): Signature: Date:

699-42-37

****

THE BELOW HYDRAULIC CONDUCTIVITY VALUE WAS CALCULATED
USING THE BOUWER AND RICE SLUG TEST METHOD.
SOURCE= "THE BOUWER AND RICE SLUG TEST-AN UPDATE"
GROUND WATER, VOL 27, NO. 3, MAY-JUNE 1989.

****

Rc (ft)	Rw (ft)	Le (ft)	Lw (ft)	H (ft)
.1670	.3330	10.3000	53.7000	144.5000

****

Le/Rw = 30.9309300
A= 2.5426880
B= 3.823192E-001
C= 2.1450520
t (min)= 1.5000000
1/t= 6.666667E-001
Yo= (ft) 1.9000000
Yt= (ft) 1.0000000
1/t ln(Yo/Yt)= 4.279026E-001
ln[(H-Lw)/Rw]= 5.6082720
ln(Re/Rw)= 2.7178900

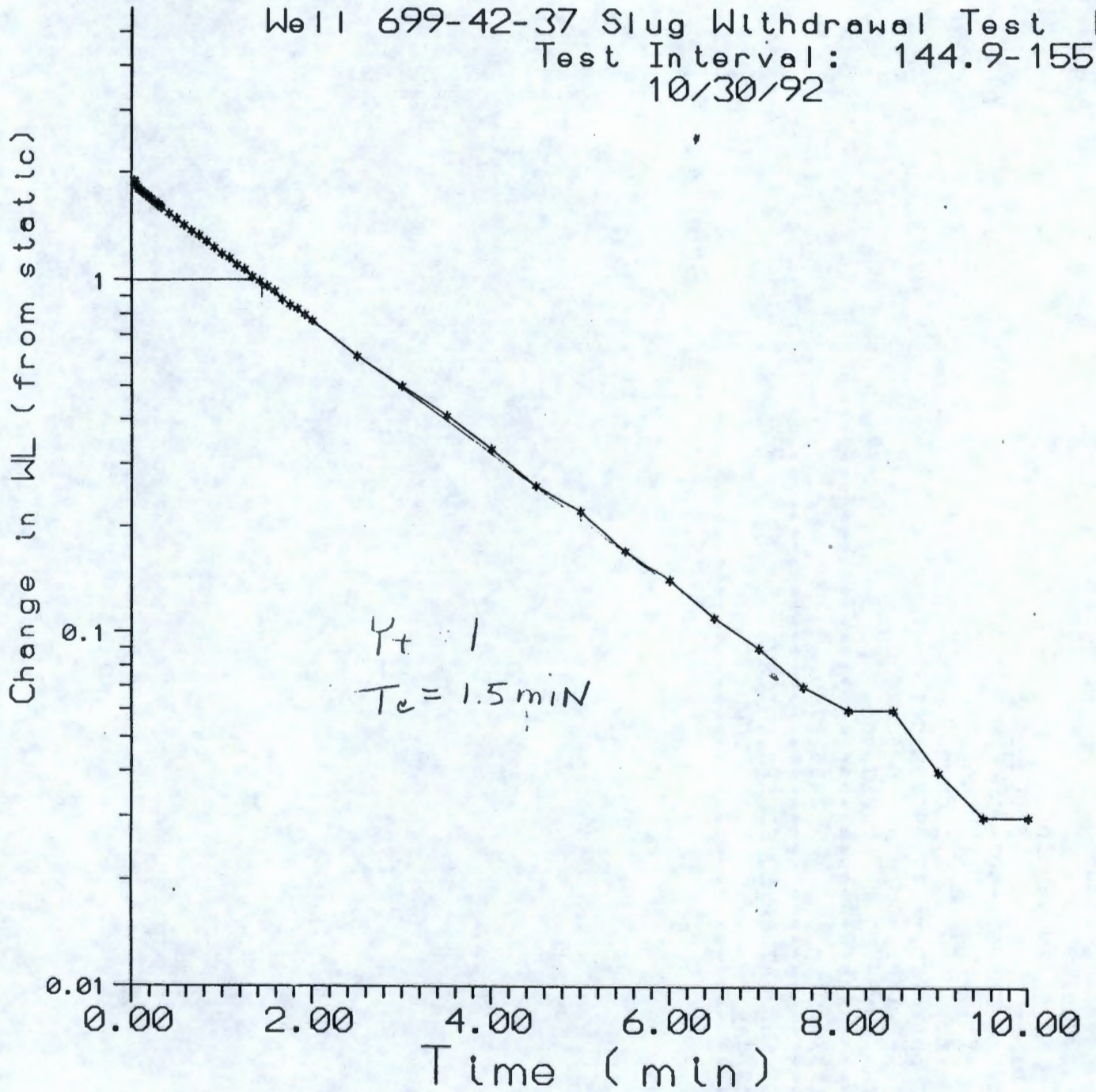
****

K (ft/day) = 2.2672790

****

T OF THE SATURATED SCREEN INTERVAL
(ft2/day)= 23.3529800

****


Well 699-42-37 Slug Withdrawal Test Ho=1.90
Test Interval: 144.9-155.2
10/30/92
Change in WL (from static)
1
0.1
0.01
0.00
2.00
4.00
6.00
8.00
10.00
Time (min)
Yt 1
Tc = 1.5 min

APPENDIX C

PURGEWATER DETERMINATION FOR AQUIFER TESTING ACTIVITIES

Westinghouse Hanford Company

Internal Memo

From: Geochemistry & Hydrochemistry 81232-93-004
Phone: February 5, 1993
Date: 6-6465 H6-06
Subject: PURGEWATER DETERMINATION FOR AQUIFER TESTING ACTIVITIES

To:

	A. J. Knepp	H6-06
	D. G. Horton DGH	H6-06
	C. D. Delaney	H6-06
	L. C. Swanson	H6-06
cc:	W. R. Thackaberry	H4-16
	BHF File/LB	

Attachment 1 contains the purgewater determination for two aquifer testing activities, 200-UP-1 and Project W-049H. The two columns located beneath the general heading "Purgewater Determination" specify the collection requirement for each well. The definition for each column is as follows:

Collect/contain. A purgewater designation which is applied to wells which require collection of purgewater in a tank truck and transport of the purgewater to an above-ground storage unit. [NOTE: Water MUST be collected in a stainless-steel tank truck.] Three categories of collect/contain requirements are identified in the "Purgewater Strategy Document":

Category I. A well which is located within the 200 West boundary (except for the expansion area).

Category II. A well which has at least one constituent which exceeds a containment criterion listed in Table 1 of the "Purgewater Strategy Document".

Category III. A well for which there is insufficient analytical information to make a purgewater determination.

Collect/dispose elsewhere. A purgewater designation which is applied to wells which do not require Category I, II, or III containment but are located in a restricted disposal area. Purgewater from these wells must be collected and transported elsewhere on the Hanford Site for disposal (may use a carbon steel tank truck.)

Dispose at well. A purgewater designation which is applied to wells which may have the purgewater disposed to the ground in the immediate vicinity of the well head.

Hanford Operations and Engineering Contractor for the US Department of Energy

Restricted disposal area. A location designated in Section 3.2.2 of the "Purgewater Strategy Document" and categorized as "Collect/dispose elsewhere" per this procedure. Restricted disposal areas are:

- designated RCRA Solid Waste Management Units (SWMUs)
- burial grounds
- active/inactive liquid effluent disposal sites
- known surface or subsurface soil contamination areas.

Attachment 2 contains purgewater exceedances from the Groundwater Database. Attachment 3 contains a list of the most recent tritium results (by well.) This information is provided for your own evaluation of wells that might exceed the total activity shipping requirements based on tritium alone.

This determination is effective for 90 days from issuance. It must be reviewed if additional sampling is scheduled on these wells subsequent to that date or for any wells which are added to the network (on an individual basis.)

B. H. Ford, Senior Scientist
Geochemistry & Hydrochemistry

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Attachment 3

Attachment 1

Well	Project	Collect/ Contain	Collect/ Dispose to the Ground	Dispose to Ground at Well
6-40-36	W-049H			W
6-41-35	W-049H			W
6-42-37	W-049H			W
6-40-39	W-049H			W
6-41-40	W-049H			W
6-42-39A	W-049H			W
6-42-39B	W-049H			W
6-42-40A	W-049H			W
6-43-40	W-049H			W
6-43-41E	W-049H			W
6-43-41F	W-049H			W
6-43-41G	W-049H			W
2-W12-1	UP1AQTEST	I		
2-W11-10	UP1AQTEST	I		
2-W14-10	UP1AQTEST	I		
2-W22-41	UP1AQTEST	I		
6-38-70	UP1AQTEST	II		
6-35-70	UP1AQTEST	II		

NOTES:

I -
This well is located within the 200 West boundary (excluding the expansion area).

II -
This well contains one or more results which exceed a purgewater criterion (see Attachment 2 for details).

III -
There is insufficient analytical information to make a purgewater determination for this well. It must be contained until further information is available.

DE -
This well does not require containment but may not be disposed to the ground in the immediate vicinity of the wellhead. The water from this well must be collected and transported elsewhere (a clean area) on the Hanford Site for disposal to the ground.

W -
This well may be disposed to the ground at the wellhead unless it is located in an underground/surface contamination zone. If it is located in one of these zones, the well is to be redesignated in the field as a Collect/Dispose Elsewhere (DE) well. Notify the Geosciences Purgewater Coordinator of this redesignation (DSI is adequate).

Attachment 2

1/29/93 PURGEWATER CRITERIA EXCEEDANCES Page 1

Project	Well	Date	Result	Constituent	Purgewater Limit	Units
UP1AQTEST	6-35-70	7/09/87	47.2	Iodine-129	10.0	PCI/L
UP1AQTEST	6-35-70	4/15/91	44.1	Iodine-129 (Drinking Water Standard)	10.0	PCI/L
UP1AQTEST	6-38-70	8/18/92	53.0	Carbon tetrachloride	50.0	PPB

Attachment 3

1/29/93 PURGEWATER QUERY - MOST RECENT TRITIUM RESULTS Page 1

Project	Well	Date	Code	Result	LT
UP1AQTEST	2-W12-1	9/26/88	108	6730	
UP1AQTEST	2-W14-10	4/12/90	108	1220	
UP1AQTEST	2-W22-41	9/04/92	108	2010	
UP1AQTEST	6-35-70	12/04/91	108	620000	
UP1AQTEST	6-38-70	12/30/91	108	849	
W-049H	6-40-39	6/24/92	108	-7	U
W-049H	6-41-40	6/24/92	108	178000	
W-049H	6-42-39A	10/21/92	108	103000	
W-049H	6-42-39B	10/28/92	108	111000	
W-049H	6-42-40A	6/25/92	108	211	U
W-049H	6-43-40	6/26/92	108	62100	
W-049H	6-43-41E	6/24/92	108	78500	
W-049H	6-43-41F	6/25/92	108	53500	
W-049H	6-43-41G	10/28/92	108	67500	

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