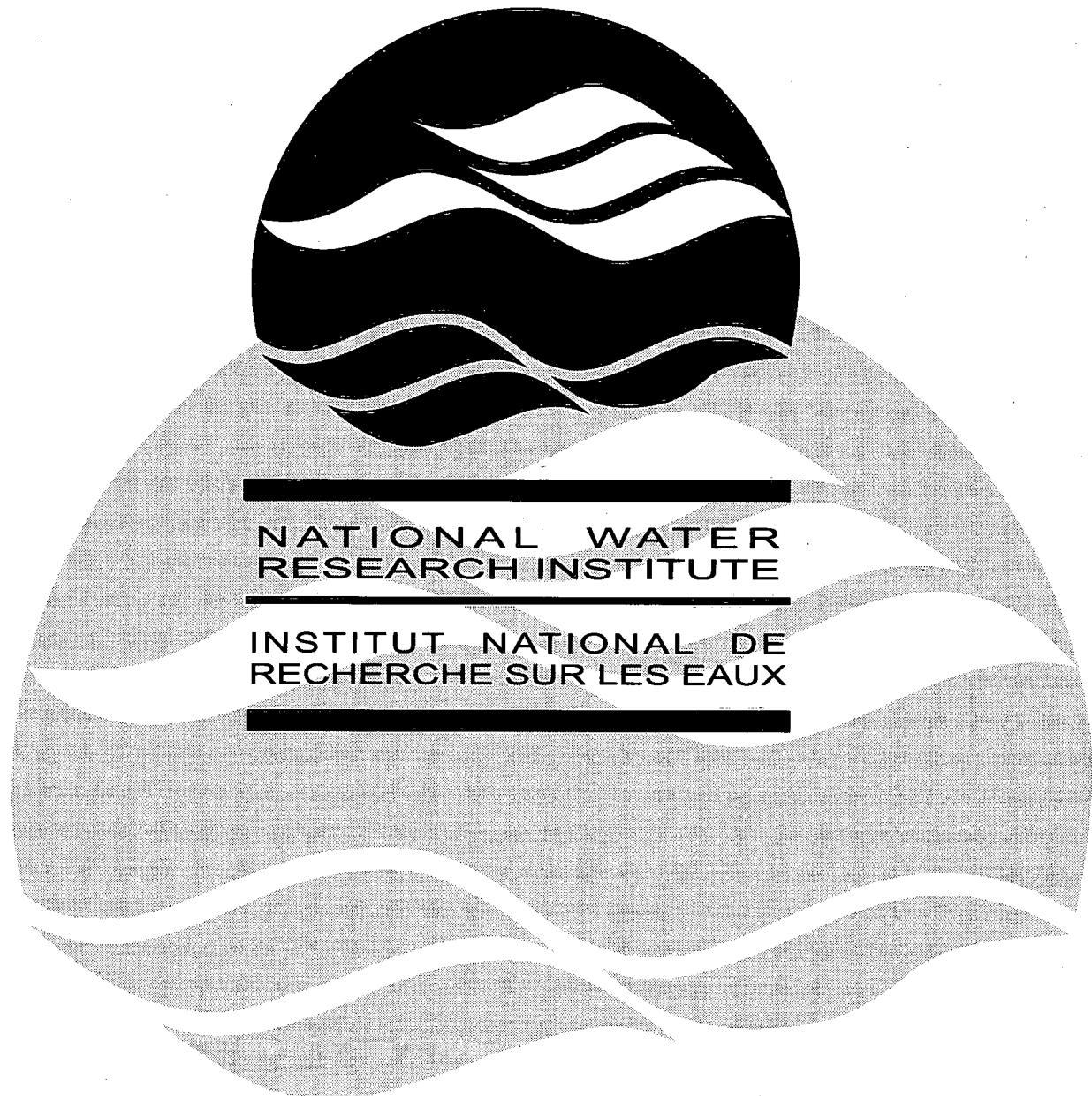


MASTER 00-057



**WESTBAY COMPLETION REPORT
FOR MP38 MONITORING WELLS
No. 34C, 37C, 64, 66 & 67
CWML SITE,
SMITHVILLE, ONTARIO**

TD
226
N87
no.
00-057

J. Voralek, C. Talbet and P. Lapcevic

NWRI Contribution Number 00-057

WESTBAY COMPLETION REPORT

for

MP38 Monitoring Wells No. 34C, 37C, 64, 66 & 67

CWML Site, Smithville, Ontario

by

John Voralek, Charlie Talbot, and Pat Lapcevic

**National Water Research Institute
867 Lakeshore Road
Burlington, Ontario**

January 2000

NWRI Cont. #00-57

MANAGEMENT PERSPECTIVE

Conservation of biodiversity in healthy ecosystems. Priority ecosystems are conserved and restored.

As part of the Smithville studies, Westbay borehole instrumentation was installed in 5 boreholes at the site. John Voralek and Charlie Talbot (Technical Operations Division) were trained and certified by Westbay Instruments to install this equipment at significant savings to the program. This report presents the details of the installed systems and summarizes the procedures used for the installation. From these newly installed boreholes we have been monitoring hydraulic heads on a weekly basis. These hydraulic head measurements will be used to further our understanding of groundwater flow and contaminant transport in fractured rock systems. This is essential to improving our ability to predict and prevent the environmental effects of toxic substances in groundwater and help to conserve and restore priority ecosystems in the Great Lakes Basin.

This report is intended for information and completeness only. The boreholes instrumented in this study are included in an ongoing weekly monitoring program. Besides this monitoring, no further work is planned at the present time.

SOMMAIRE À L'INTENTION DE LA DIRECTION

Conservation de la biodiversité dans les écosystèmes sains. Les écosystèmes prioritaires sont conservés et remis en état.

Dans le cadre des études de Smithville, de l'appareillage de trou de sonde Westbay a été installé dans 5 trous de sonde sur le site. John Voralek et Charlie Talbot (Division des opérations techniques) ont été formés et accrédités par Westbay Instruments pour installer cet équipement, ce qui a entraîné des économies substantielles pour le programme. Ce rapport décrit en détail les systèmes installés et résume les procédures suivies pour l'installation. À partir de ces trous de sonde récemment installés, nous avons surveillé les charges hydrauliques avec une fréquence hebdomadaire. Ces mesures des charges hydrauliques serviront à mieux comprendre l'écoulement souterrain et le transport des contaminants dans des systèmes rocheux fracturés. Elles sont essentielles pour améliorer notre capacité de prévoir et de prévenir les incidences environnementales des substances toxiques dans les eaux souterraines et aider à conserver et à rétablir les écosystèmes prioritaires dans le bassin des Grands Lacs.

Ce rapport n'est destiné qu'à fournir de l'information et à rendre des comptes. Les trous de sonde ainsi instrumentés dans le cadre de cette étude sont intégrés à un programme de surveillance hebdomadaire permanent. À part cette surveillance, on ne prévoit pas d'autres travaux à l'heure actuelle.

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Abstract

An integral part of the Smithville field studies has been the drilling and instrumentation of twenty new boreholes in and around the site area. All of these boreholes intersect the total length of the Lockport dolostone. To obtain representative groundwater samples at various levels and measure vertical variations in hydraulic head, it is essential that the boreholes be instrumented in such a manner that specific horizons are isolated. The Westbay® System of borehole instrumentation is a modular design having water-filled packers connected by casing elements and specially designed pumping and measurement/sampling ports. The packers isolate distinct zones in each borehole. Water pressure is measured and representative groundwater samples are obtained using a submersible probe which is lowered into the casing and connected to an electronic data acquisition device on surface. Groundwater samples can be obtained using the same port by opening a valve from the surface unit and allowing water to fill a sample container attached below the probe.

In 1996 and 1997 six of these new boreholes were instrumented with Westbay multi-level instrumentation. In 1999 an additional six boreholes were completed with this type of instrumentation. This report outlines the design of the borehole instrumentation and summarizes the installation procedures.

Résumé

Le forage et l'instrumentation de vingt nouveaux trous de sonde sur le site et aux alentours ont fait partie intégrante des études *in situ* de Smithville. Tous ces trous de sonde coupent la longueur totale de la dolomie de Lockport. Pour obtenir des échantillons représentatifs d'eau souterraine à divers niveaux et mesurer les variations verticales de la charge hydraulique, il est essentiel que les trous de sonde soient instrumentés de manière à isoler des horizons précis. Le système d'appareillage WestBay® destiné aux trous de sonde est de conception modulaire et contient des packers remplis d'eau rattachés par des éléments de tubage, ainsi que des orifices d'échantillonnage, de mesure et de pompage spécialement conçus à cette fin. Ces packers isolent des zones distinctes dans chaque trou de sonde. On mesure la pression de l'eau et on obtient des échantillons représentatifs des eaux souterraines en utilisant un capteur submersible qui est descendu dans le tubage et relié à un dispositif électronique d'acquisition des données, situé en surface. On peut obtenir des échantillons d'eau souterraine par le même orifice en ouvrant une soupape à partir de l'unité de surface et en laissant l'eau remplir un récipient attaché sous le capteur.

En 1996 et 1997, six nouveaux trous de sonde ont été équipés au moyen de l'appareillage à niveaux multiples Westbay®. En 1999, six autres trous de sonde ont été ainsi instrumentés. Le présent rapport décrit la conception de l'appareillage des trous de sonde et résume les procédures d'installation.

Introduction

This report documents the procedures used during the installation of Westbay® MP38 instrumentation in five boreholes at the CWML site in Smithville, Ontario. As part of an ongoing site characterization project five NQ (76 mm inside dia.) boreholes were drilled, tested hydraulically, and videotaped using a submersible camera prior to the Westbay® installation. The packer and port locations were chosen based on the results obtained from the hydraulic testing and camera logs. The results of the hydraulic testing and a general description of Westbay® instrumentation can be found in Novakowski et al. (1999) and Lapcevic et al.(2000).

Installation of the Westbay® MP system was carried out by John Voralek, and Charlie Talbot. John Voralek is trained as a certified Westbay® MP System technician.

Installation Procedures

The methods used to install the instrumentation are based on the previous installations of similar instrumentation at the site (Westbay Instruments Inc., 1996 and Voralek, 1997).

Monitoring Well Design

Monitoring zone locations for all wells were generated on Well Designer® software (Westbay Inc.). The MP Casing logs were used as an installation guide in the field. Field copies of the Installation logs are included in the Appendices. Log design included an MP measurement port coupling located in each zone at the base of each packer. This port provides the capabilities to measure fluid pressure and collect fluid samples in each zone. A pumping port coupling was also included in each zone to provide purging and hydraulic conductivity testing capabilities.

Model 0204M15 packers were used for this project. Table 1 summarizes the borehole characteristics and completed monitoring zones.

Table 1. Summary of Borehole Characteristics.

Borehole	Date Drilled	Elevation (masl)	Trend (°)	Plunge (°)	Total Length of Borehole (mbgs)	Westbay Casing Length (mbct)	Number of Monitoring Zones
34C	18-Nov-95	192.94	115	57	56.24	52.07	8
37C	18-Nov-95	192.23	0	55	56.16	55.07	9
64	28-May-97	192.60	341.5	56	59.06	59.07	10
66	16-Nov-98	192.49	324	55	56.52	57.07	8
67	20-Nov-98	192.96	4	54.5	56.46	55.07	8

Layout of MP Casing Components

For each MP System installation, the MP casing components were set out at the onsite storage area according to the sequence indicated on the MP Casing Installation log. Each casing length was numbered, beginning with the lowermost, as an aid to confirming the proper sequence of components. The appropriate MP System couplings were attached to the casings. Magnetic collars were attached 0.5 m below each measurement port. Each casing component was visually inspected. Serial numbers for each packer, measurement port coupling and pumping port coupling were recorded on the MP Casing Installation Log. The well component layout was confirmed with the log prior to the lowering the components in the borehole.

Lowering of MP Casing Components

The MP casing components were placed in each borehole in the sequence indicated on

the MP Casing Installation Log. Each casing joint was tested with a minimum internal hydraulic pressure of 150 psi for one minute to confirm water-tightness. The record of each successful joint test and the placement of each casing component is noted on the MP Casing Installation Log. Geotextile filters were placed over each measurement port coupling after joint testing. Water was added inside the casing to overcome buoyancy effects. MP casing was lowered into the borehole until the midpoint of the top coupling was level with the steel surface casing. The MP casing string was held in this position while packer inflation was carried out.

Inflation of MP System Packers

The packers were inflated individually with clean tap water beginning with the lowermost packer in each well. Each packer was inflated to a target internal pressure of 190 psi above the ambient pressure at the packer location. The volume injected into each packer was between 1.0 and 1.5 litres. The data for the inflation of each packer are recorded on the MP Packer Inflation Records included in Appendices A to E. A secondary test to ensure water tightness was carried out by filling the inside of the casing with water to the top and observing any decline in water level. This test method ensured a sound installation in all boreholes.

Surface Completion

After the packers had been inflated the top coupling was removed from the MP casing and replaced with a soft walled protective end cap. The steel casing was cemented in and a threaded steel well protector ensures security of the borehole.

A Summary Casing Installation Log, which shows the final as-built configuration of the

surface completion is included for each well in Appendices A to E.

Fluid Pressure Measurements

After installation and packer inflation were completed in each well, fluid pressures were collected at each measurement port using the 'Differential Pressure' method. With this method, equivalent water levels are calculated based on the difference between outside and inside fluid pressure with respect to a measured inside casing water level. This method does not require the depth below casing top of the measurement port in the calculation of fluid pressures. For simplicity, NWRI procedure is to fill the casing to the top and use this point as the inside casing water level or reference datum. Data was obtained using the Westbay® hand-held control unit and then processed onto a master spreadsheet. The fluid pressure data were examined for confirmation of proper operation of the measurement ports and as a first check on the presence of annulus seals between monitoring zones. Measurements of the vertical distribution of calculated hydraulic head for each borehole on a given day (July 6, 1999) are included in Appendix F.

References

Lapcevic, P., K. Novakowski, J. Voralek, G. Bickerton, C. Talbot and L. Zanini, Results of Investigations in the Proximity of the Source Zone at the CWML Site, Smithville, Ontario, National Water Research Institute, Burlington, Ontario, Canada, 60 pp., 2000.

Novakowski, K., P. Lapcevic, G. Bickerton, J. Voralek, L. Zanini and C. Talbot, The development of conceptual model for contaminant transport in the dolostone underlying Smithville, Ontario, National Water Research Institute, Burlington, Ontario, Canada, NWRI Contribution No. 99-250, 245pp., 1999.

Voralek, J. W., Westbay Completion Report for MP38 Monitoring Wells, No. 63 and 65, NWRI, 1997.

**Westbay Instruments Inc., Westbay Completion Report for MP38 Monitoring Wells No. 53, 60,
61, 62 Smithville Site, Project No. WB761-96, 1996.**

Acknowledgements

Advice and technical support from Dave Mercer of Westbay Instruments is gratefully acknowledged.

**Appendix A
Installation logs for borehole 34C**

Summary Casing Installation Log

Well No. 34
Job No.

Client NWRI
Site Smithville
Project Description

Well Information

Reference Datum

Elevation of Datum 0.00 m.

Position of MP Casing Top above / below Datum 0.00 m. above datum

Position of MP Casing Bottom Below Datum 52.07 m. below datum

Well Description

Other References

Log Information

Designed By J. A. PL.

Date May 1/99

Approved By PL

Date 17 May 2/99

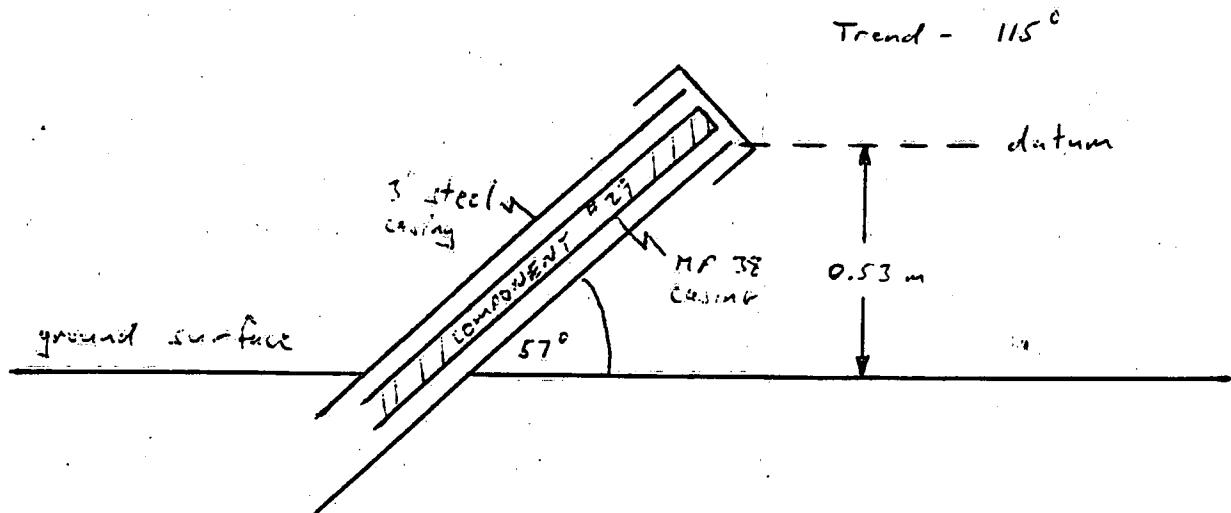
Checked By JV

Date 17 May 10/99

Computer File No. 34

Date Fri May 14 15:13:31 1999

Sketch of Wellhead Completion



Well Designer Report

Date: Thu May 20 09:38:24 1999

Page: 1

Well No. 34



Westbay

Deflation tool - 125 psi
Inflation tool cracking - 380
" " seal - 230 - 240

Page ____ of ____

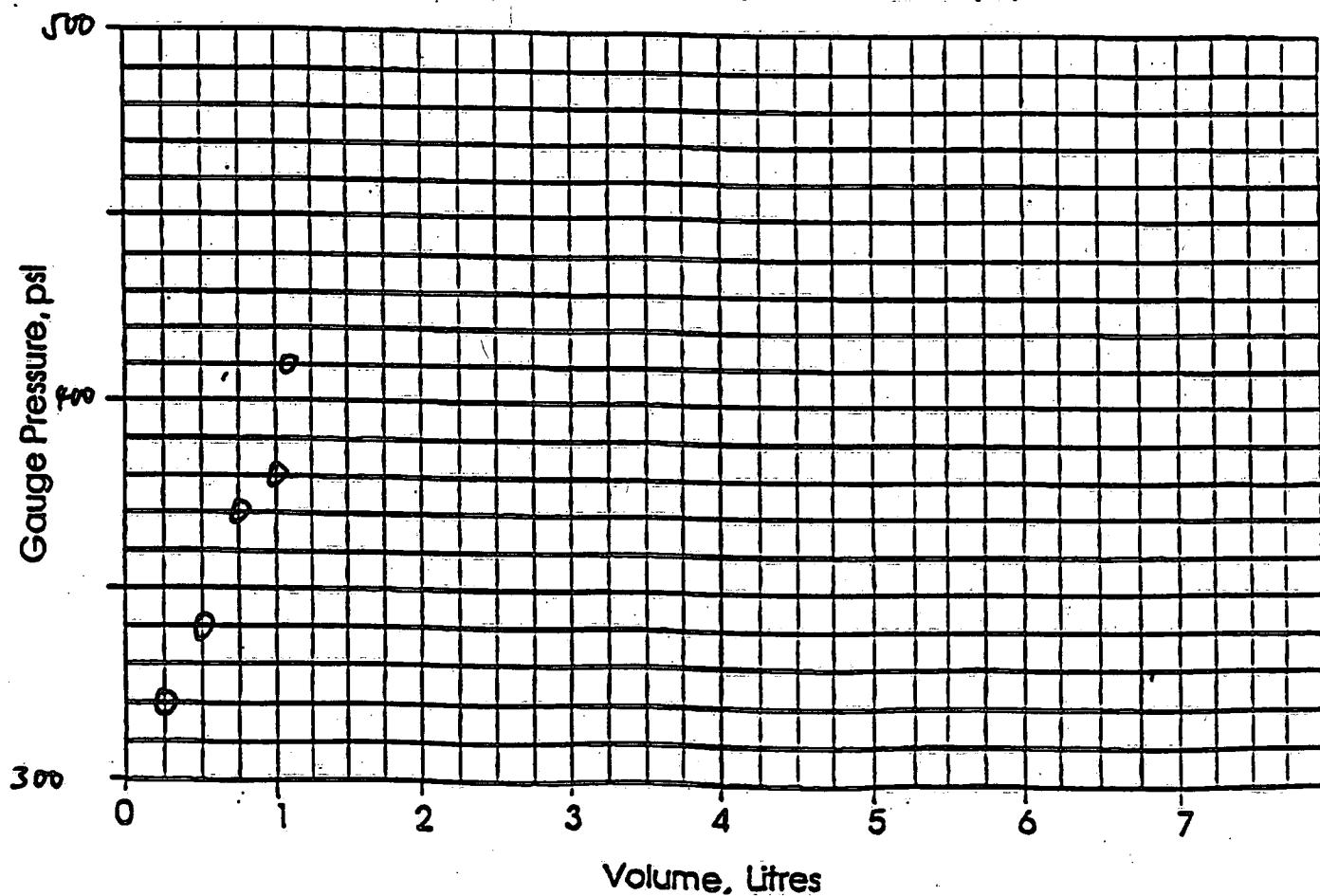
MP Packer Inflation Record

Project: _____ Job number: _____
Location: Smithville Completed by: JV & CT
Hole No.: BH - 34C Date Inflated: May 18/99
Packer No.: 3 Depth(m / ft) _____
Inflation Tool Setting (psi) 240 Depth to Standing Water (m / ft)
- open hole

Volume (Litres)	0.25	0.50	0.75	1.00	1.10	1.00					
Pressure (PSI)	320	340	370	380	420	Ø					

final inflation volume - 1.00 l final inflation pressure 180 psi

Plot of Gauge Pressure (PSI) vs. Volume (L)





Westbay

Page ____ of ____

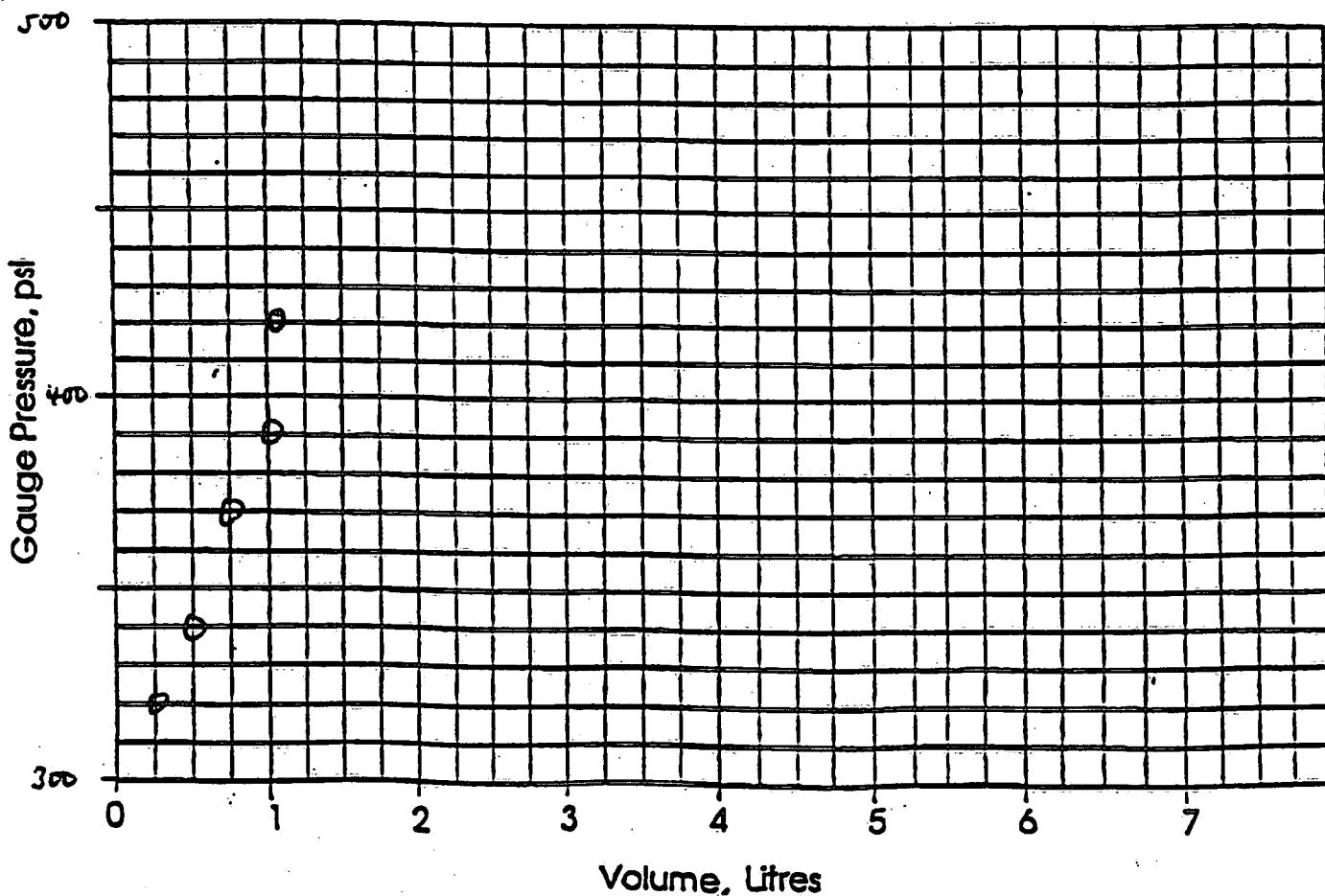
MP Packer Inflation Record

Project: _____ Job number: _____
Location: Smithville Completed by: JV & CT
Hole No.: 34C Date Inflated: May 18/99
Packer No.: 7 Depth(m / ft) _____
Inflation Tool Setting (psi) 240 Depth to Standing Water (m / ft)
- open hole

Volume (Litres)	0.25	0.50	0.75	1.00	1.10	1.00					
Pressure (PSI)	320	340	370	390	420	μ					

inflation volume - 1.00 l inflation pressure - 180 PSI

Plot of Gauge Pressure (PSI) vs. Volume (L)





Westbay

Page ____ of ____

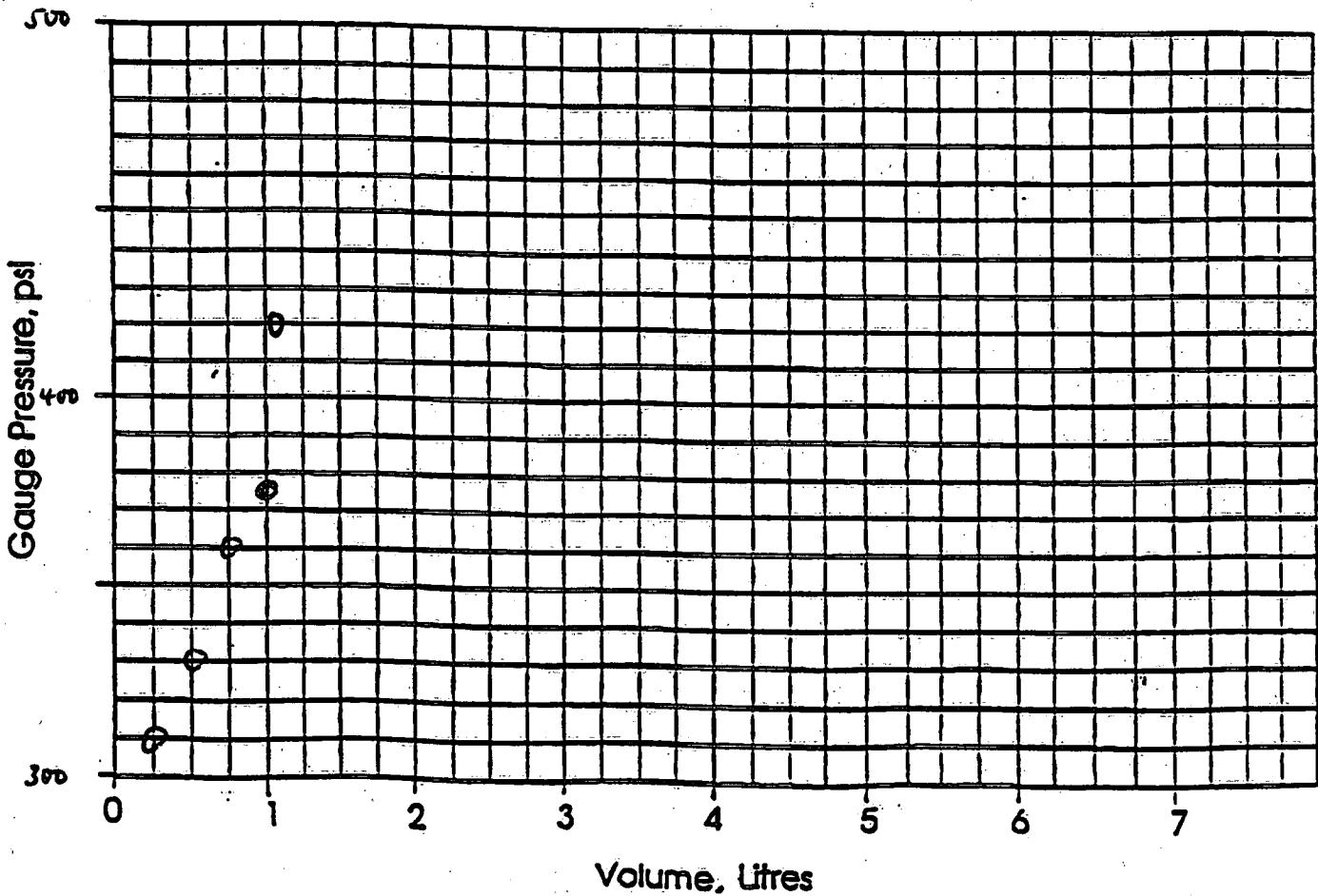
MP Packer Inflation Record

Project: _____ Job number: _____
Location: Smithville Completed by: JV & CT
Hole No.: BH 34C Date Inflated: May 18/99
Packer No.: 10 Depth(m / ft) _____
Inflation Tool Setting (psi) 240 Depth to Standing Water (m / ft)
- open hole

Volume (Litres)	0.25	0.50	0.75	1.00	1.10	1.0					
Pressure (PSI)	310	380	360	375	420	Ø					

inflation volume - 1.00 l inflation pressure - 180 PSI

Plot of Gauge Pressure (PSI) vs. Volume (L)





Westbay

Page ____ of ____

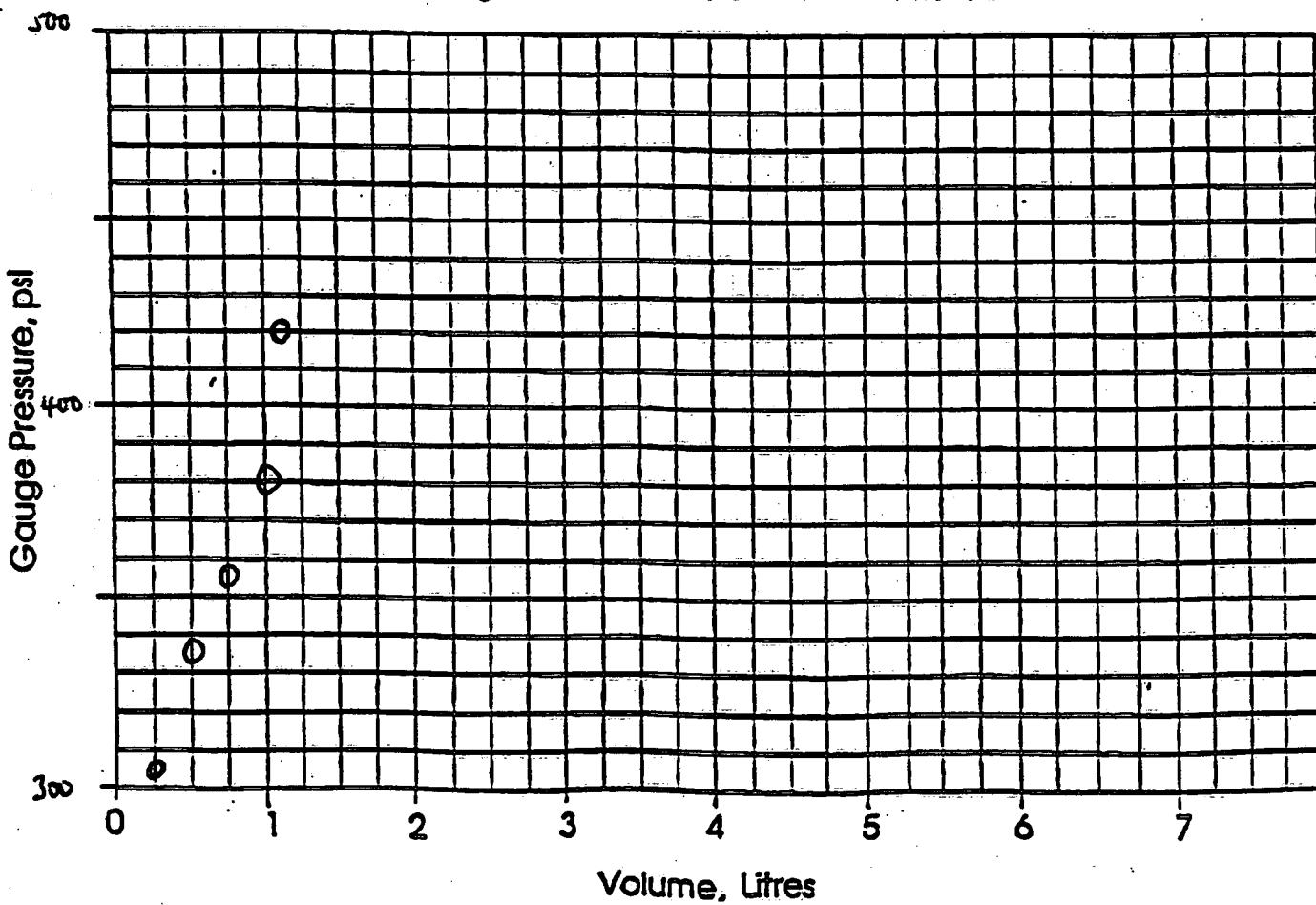
MP Packer Inflation Record

Project: _____ Job number: _____
Location: Smithville Completed by: JV & CT
Hole No.: BH 34C Date Inflated: May 18/99
Packer No.: 13 Depth(m / ft) _____
Inflation Tool Setting (psi) 240 Depth to Standing Water (m / ft)
- open hole

Volume (Litres)	0.25	0.50	0.75	1.00	1.15	1.05					
Pressure (PSI)	305	335	355	380	420	5					

inflation volume - 1.05 l inflation pressure 180 PSI

Plot of Gauge Pressure (PSI) vs. Volume (L)





Westbay

Page ____ of ____

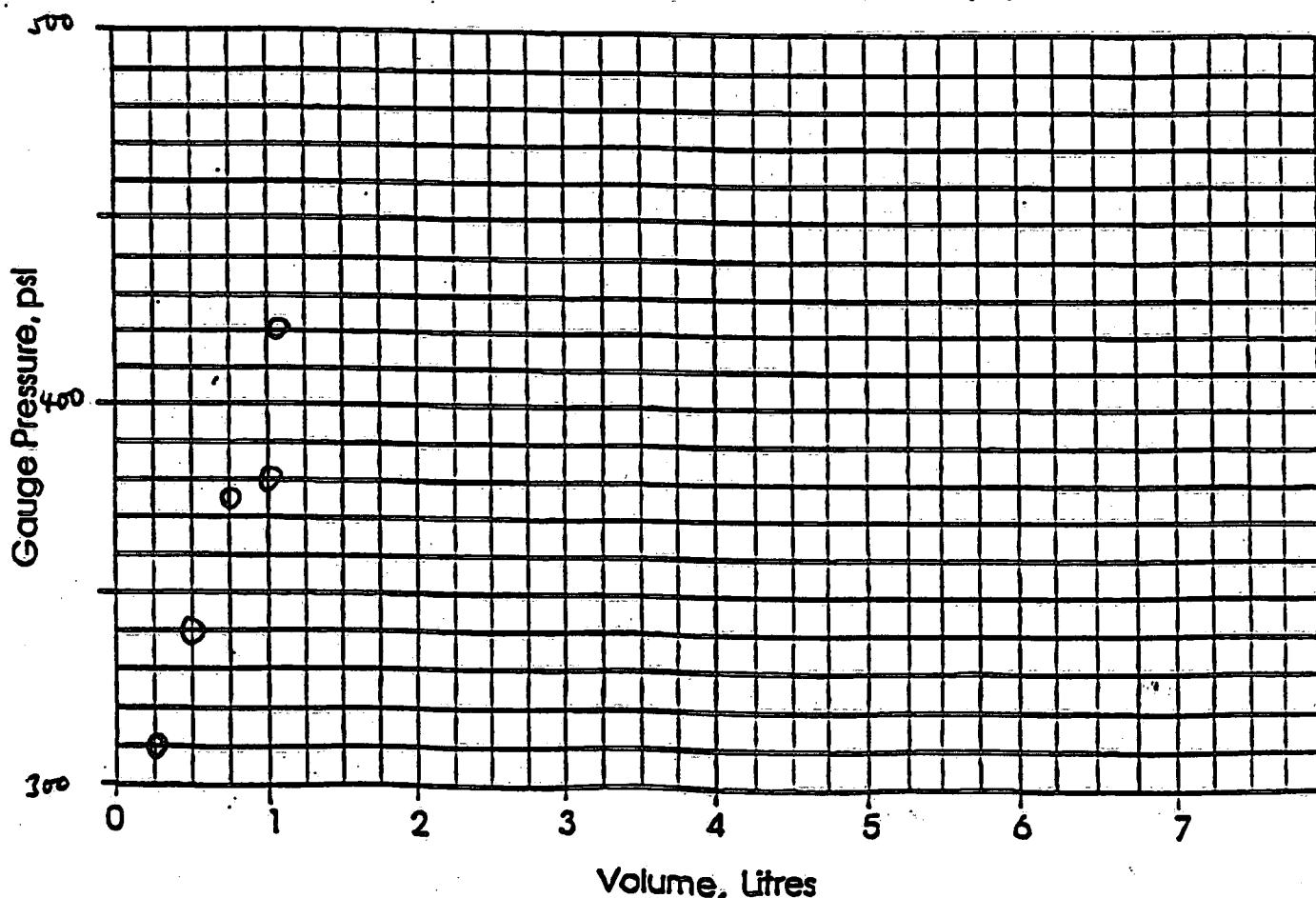
MP Packer Inflation Record

Project: _____ Job number: _____
Location: Smithville Completed by: JV & LT
Hole No.: BH 34C Date Inflated: May 18/89
Packer No.: 16 Depth(m / ft) _____
Inflation Tool Setting (psi) 240 Depth to Standing Water (m / ft)
- open hole

Volume (Litres)	0.25	0.50	0.75	1.00	1.10	1.0					
Pressure (PSI)	310	340	375	380	420	∅					

inflation volume - 1.00 l inflation pressure - 180 PSI

Plot of Gauge Pressure (PSI) vs. Volume (L)





Westbay

Page ____ of ____

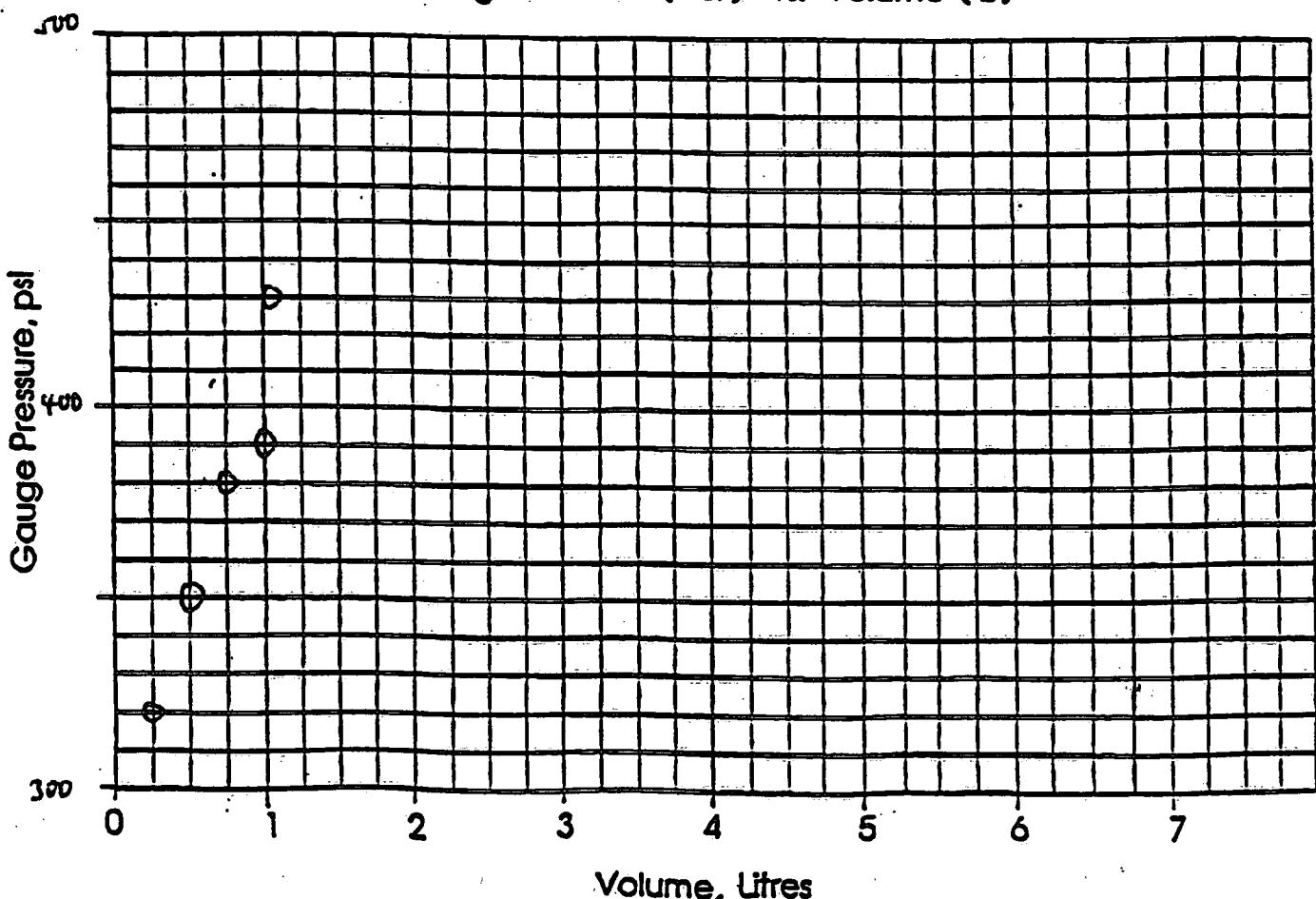
MP Packer Inflation Record

Project: _____ Job number: _____
Location: Smithville Completed by: JV & CT
Hole No.: BH 34C Date Inflated: May 18/99
Packer No.: 19 Depth(m / ft) _____
Inflation Tool Setting (psi) 240 Depth to Standing Water (m / ft)
- open hole

Volume (Litres)	0.25	0.50	0.75	1.00	1.05	1.00					
Pressure (PSI)	320	350	380	390	430	∅					

inflation volume - 1.00 l inflation pressure - 190 PSI

Plot of Gauge Pressure (PSI) vs. Volume (L)





Westbay

Page _____ of _____

MP Packer Inflation Record

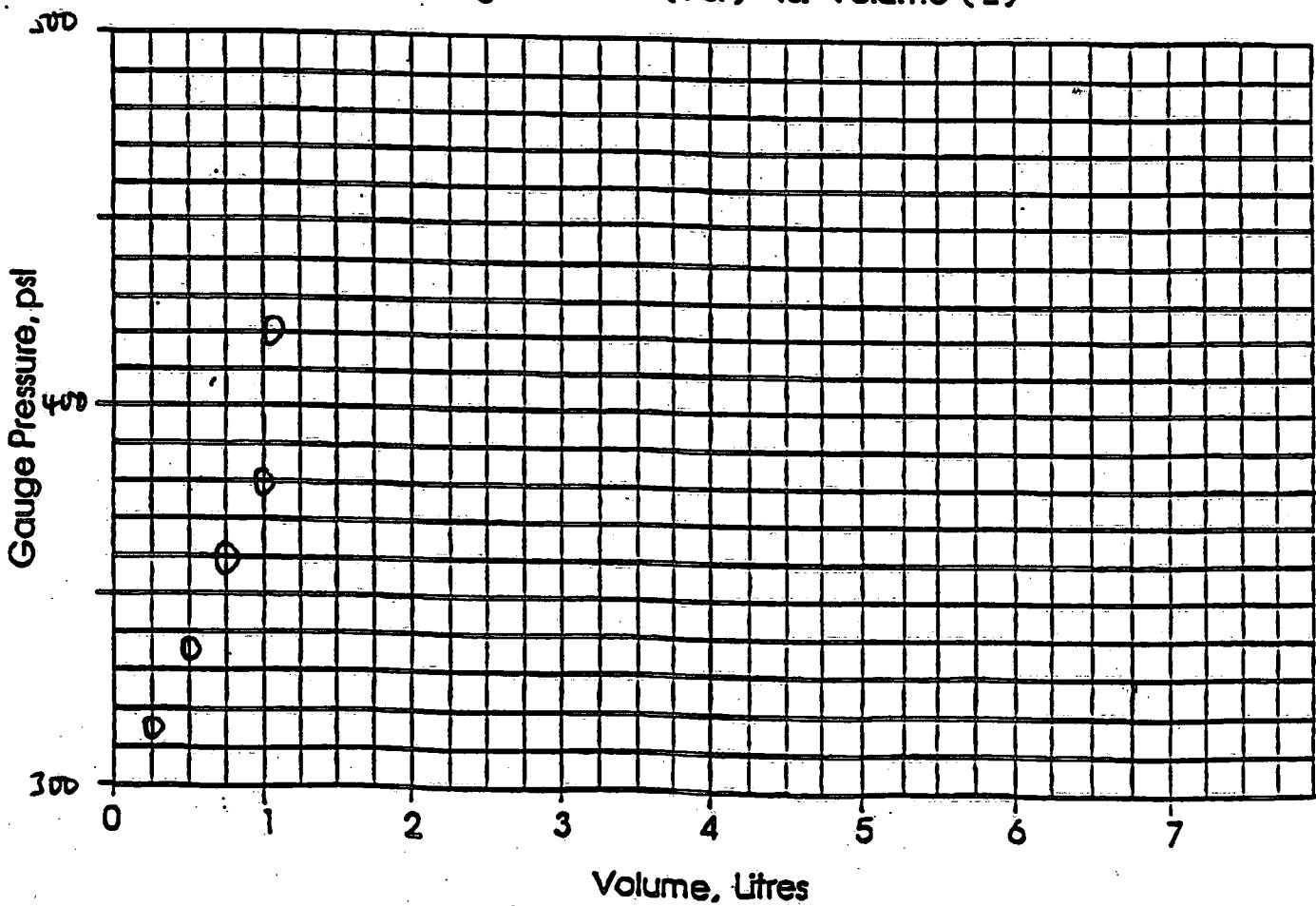
Project: _____ Job number: _____
Location: Smithville Completed by: JV & CT
Hole No.: BH 34C Date Inflated: May 18/89
Packer No.: 23 Depth(m / ft) _____
Inflation Tool Setting (psi) 240 Depth to Standing Water (m / ft)
- open hole

Volume (Litres)	0.25	0.50	0.75	1.00	1.10	1.00					
Pressure (PSI)	315	335	360	380	420	Ø					

inflation volume 1.00 l

inflation pressure - 180 PSI

Plot of Gauge Pressure (PSI) vs. Volume (L)



Well Designer Report
Job No. NWRI

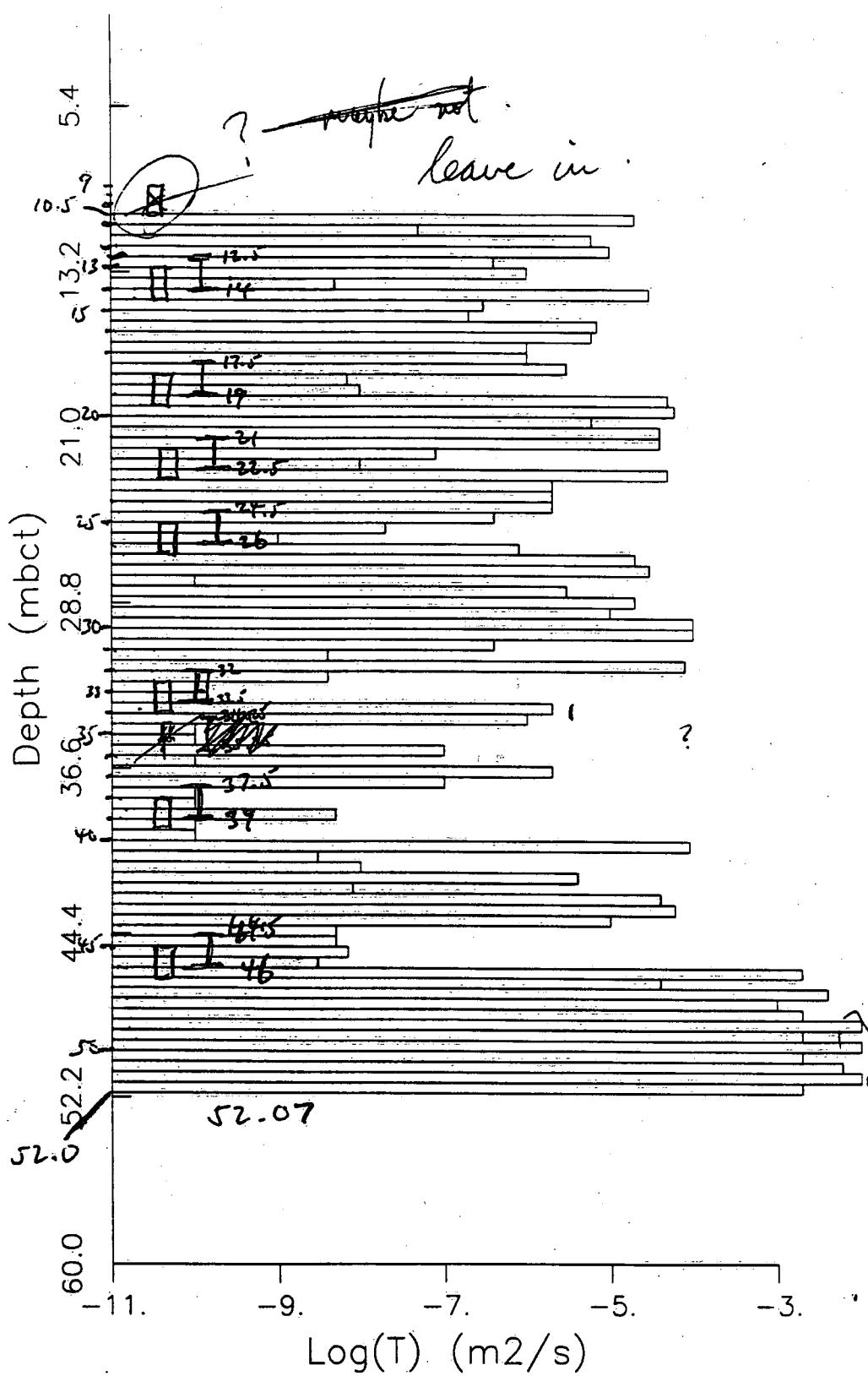
Date: Fri May 14 15:14:26 1999

Page: 1

Well No. 34

points above top zone??

BH 34 - 50 cm Spacings



Appendix B
Installation logs for borehole 37C

Summary Casing Installation Log

Well No. 37C
Job No.

Client NWRI
Site Smithville
Project Description

Well Information

Reference Datum

Elevation of Datum 0.00 m.

Position of MP Casing Top above / below Datum 0.00 m. above datum

Position of MP Casing Bottom Below Datum 55.07 m. below datum

Well Description

Other References

Log Information

Designed By JV & PL

Date May 1 / 99

Approved By PL

Date May 2 / 99

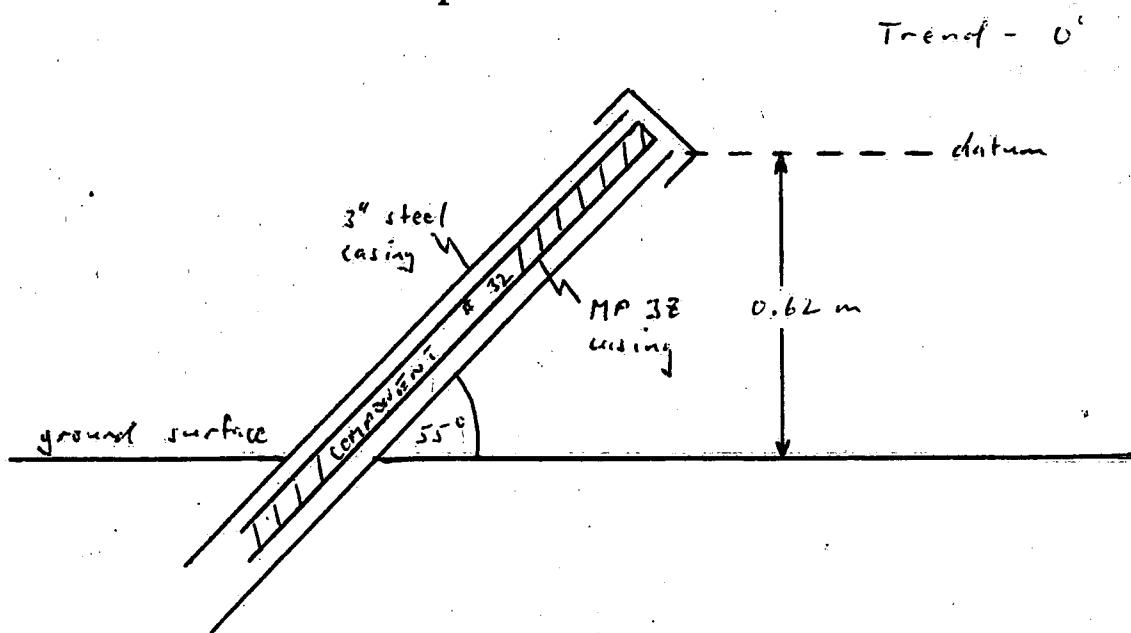
Checked By JV

Date May 10 / 99

Computer File No. 37

Date Fri May 14 16:08:04 1999

Sketch of Wellhead Completion



Well Designer Report
Job No. NWRI

Date: Fri May 14 16:08:56 1999 Page: 1

Well No. 370

Scale Meters	Gec 1	Geo 2	Well Casing	MP Loc	Tested Ok / Test / Fail	Part Desc.	Serial No.	Comments
0				32	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/>			
				31	<input checked="" type="checkbox"/>	MP38 CASING 3 METERS		
				30	<input checked="" type="checkbox"/>	MP38 CASING 3 METERS		
10	(3)	0 - 210		29	<input checked="" type="checkbox"/>	MP38 CASING 3 METERS		
				28	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> geotex	MP38 MEASUREMENT PORT MP38 PUMPING PORT	12606 5322	
				27	<input checked="" type="checkbox"/>	MP38 STANDARD PACKER	11526	
				26	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> geotex	MP38 MEASUREMENT PORT MP38 PUMPING PORT	12605 5323	
20	(3)	1.5 - 19.5		25	<input checked="" type="checkbox"/>	MP38 CASING 3 METERS		
				24	<input checked="" type="checkbox"/>	MP38 STANDARD PACKER	11521	
				23	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> geotex	MP38 MEASUREMENT PORT MP38 PUMPING PORT	12603 5296	
	(3)	21 - 23		22	<input checked="" type="checkbox"/>	MP38 CASING 1 METER		
				21	<input checked="" type="checkbox"/>	MP38 STANDARD PACKER	11530	
				20	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> geotex	MP38 MEASUREMENT PORT MP38 CASING 1.5 METERS	12604	
	(3)	2.5 - 23.5		19	<input checked="" type="checkbox"/>	MP38 PUMPING PORT	5297	
				18	<input checked="" type="checkbox"/>	MP38 CASING 1 METER		
				17	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> geotex	MP38 STANDARD PACKER MP38 MEASUREMENT PORT MP38 PUMPING PORT	11529 12614 5324	
30	(3)	29 - 31		16	<input checked="" type="checkbox"/>	MP38 CASING 3 METERS		
				15	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> geotex	MP38 STANDARD PACKER MP38 MEASUREMENT PORT MP38 PUMPING PORT	11528 12613 5298	
				14	<input checked="" type="checkbox"/>	MP38 CASING 1 METER		
	(3)	32.5 - 36		12	<input checked="" type="checkbox"/>	MP38 CASING 1.5 METERS		
				11	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> geotex	MP38 STANDARD PACKER MP38 MEASUREMENT PORT MP38 PUMPING PORT	11527 12616 5304	
				10	<input checked="" type="checkbox"/>	MP38 CASING 1 METER		
40	(3)	39.5 - 39.5		9	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> geotex	MP38 STANDARD PACKER MP38 MEASUREMENT PORT MP38 PUMPING PORT	11533 12615 5305	
				8	<input checked="" type="checkbox"/>	MP38 CASING 1 METER		
				7	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> geotex	MP38 STANDARD PACKER MP38 MEASUREMENT PORT MP38 PUMPING PORT		
				6	<input checked="" type="checkbox"/>	MP38 CASING 1 METER		
				5	<input checked="" type="checkbox"/>	MP38 CASING 3 METERS		
50	(2)	41 - 49.5		4	<input checked="" type="checkbox"/>	MP38 CASING 3 METERS		
				3	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> geotex	MP38 STANDARD PACKER MP38 MEASUREMENT PORT MP38 PUMPING PORT	11532 12617 5299	
				2	<input checked="" type="checkbox"/>	MP38 CASING 3 METERS		
60	(1)	51 - 55.07		1	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	MP38 END CAP (metric)		Last Part in Well



Westbay

Page ____ of ____

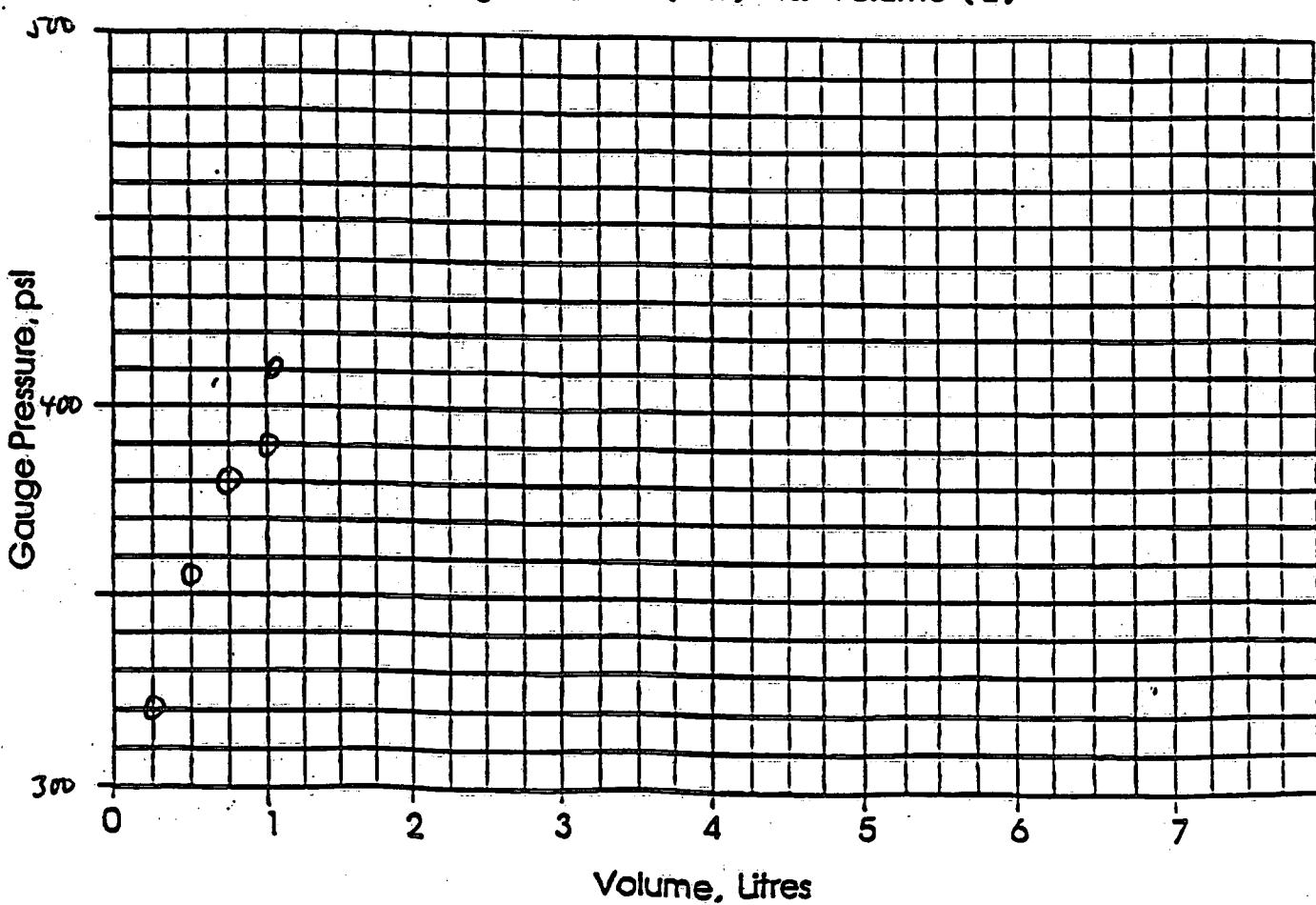
MP Packer Inflation Record

Project: _____ Job number: _____
Location: Smithville Completed by: JV & CT
Hole No.: BH 37C Date Inflated: May 17/99
Packer No.: 3 Depth(m / ft) _____
Inflation Tool Setting (psi) 140 PSI Depth to Standing Water (m / ft)
- open hole

Volume (Litres)	0.25	0.50	0.75	1.00	1.10	1.10					
Pressure (PSI)	320	355	380	390	410	X					

final inflation volume - 1.00 l final inflation pressure - 170 PSI.

Plot of Gauge Pressure (PSI) vs. Volume (L)





Westbay

Page ____ of ____

MP Packer Inflation Record

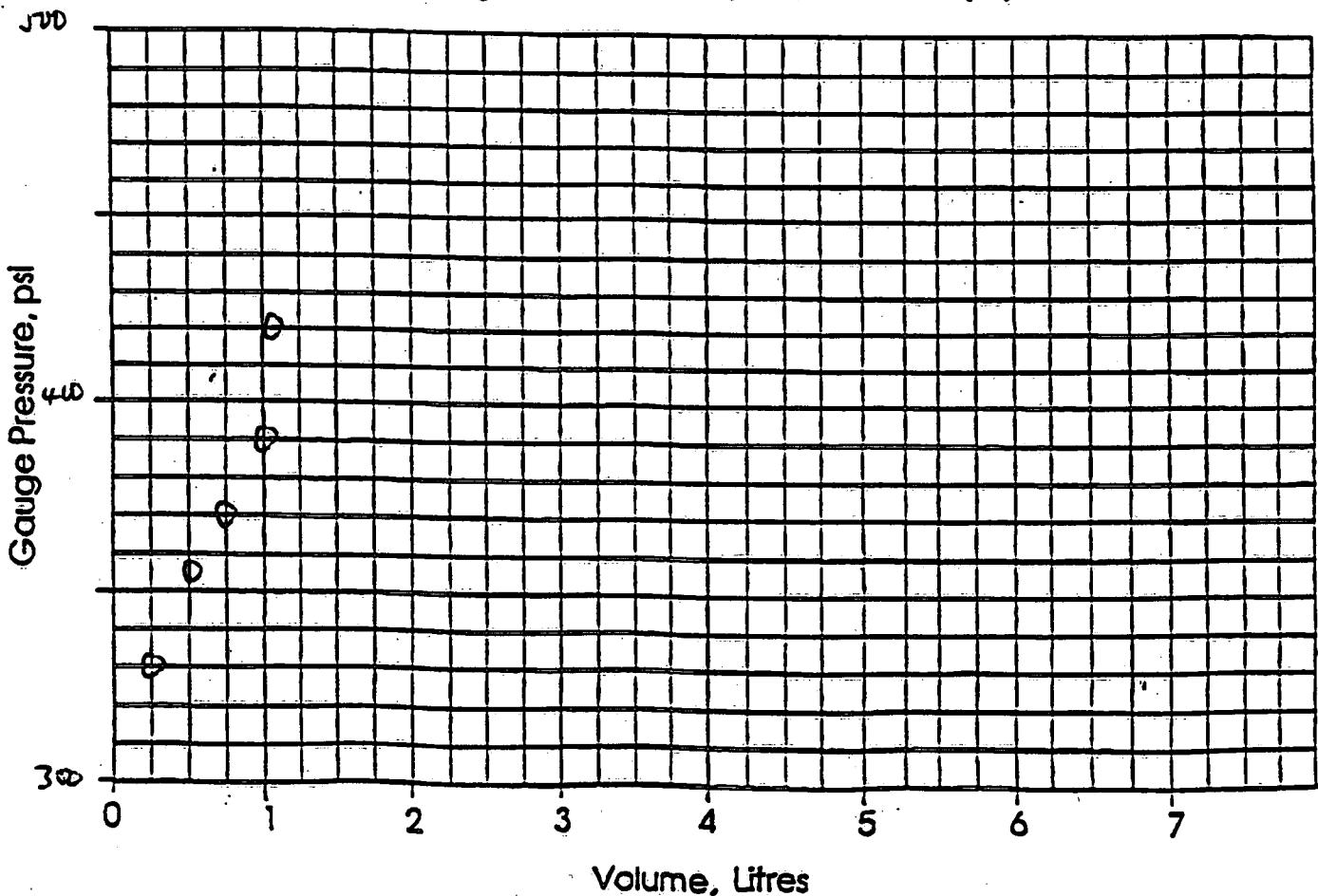
Project: _____ Job number: _____
Location: Smithville Completed by: JV & CT
Hole No.: 614 376 Date Inflated: May 17/99
Packer No.: 8 Depth(m / ft) _____
Inflation Tool Setting (psi) 240 PSI Depth to Standing Water (m / ft)
- open hole

Volume (Litres)	0.25	0.50	0.75	1.00	1.10	1.0						
Pressure (PSI)	330	355	370	390	420	450						

inflation volume - 1.00 l

inflation pressure - 180 PSI

Plot of Gauge Pressure (PSI) vs. Volume (L)





Westbay

Page _____ of _____

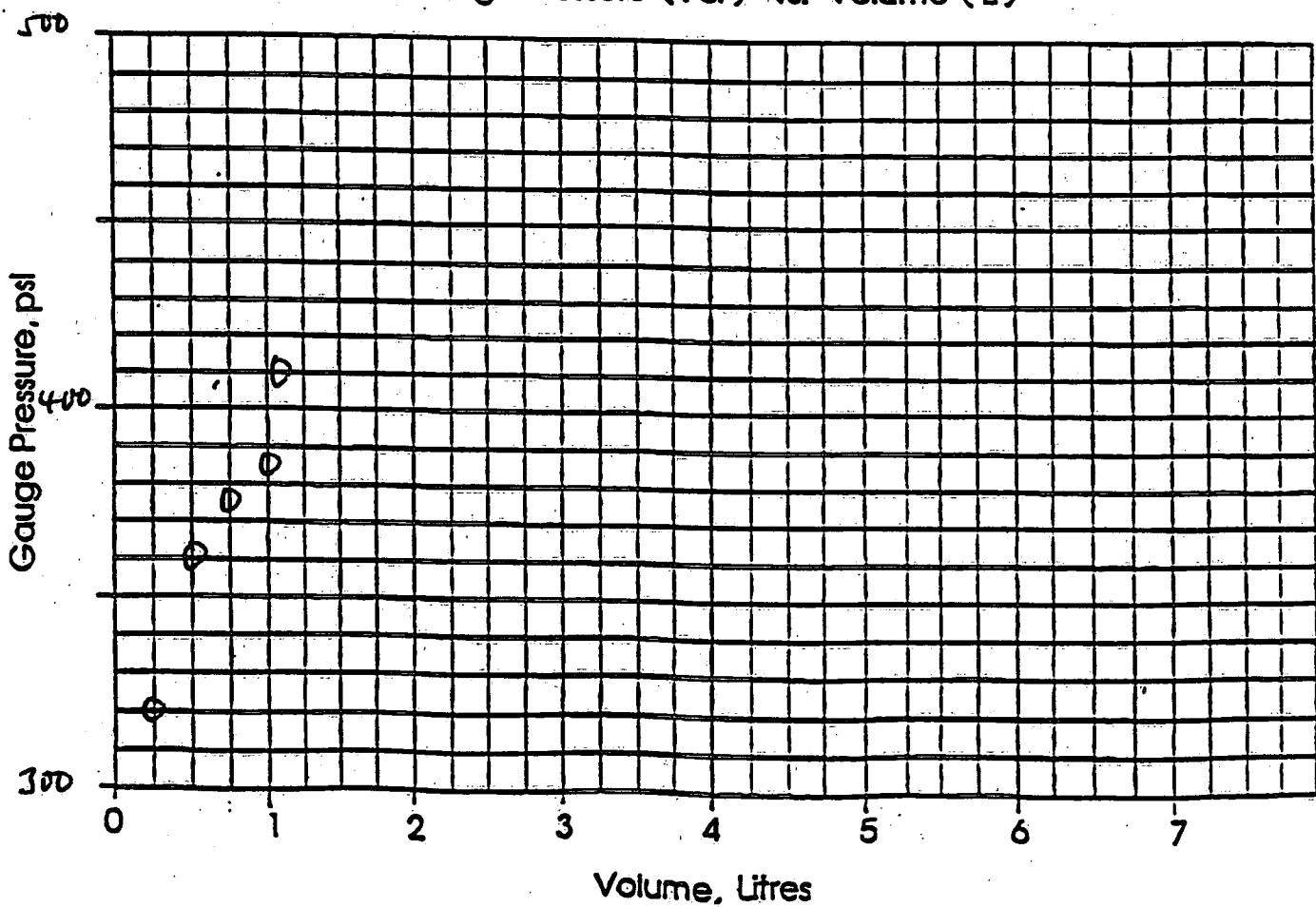
MP Packer Inflation Record

Project: _____ Job number: _____
Location: Smithville Completed by: JV & CT
Hole No.: 64 37C Date inflated: May 17/99
Packer No.: 11 Depth(m / ft) _____
Inflation Tool Setting (psi) 240 Depth to Standing Water (m / ft)
- open hole

Volume (Litres)	0.25	0.50	0.75	1.00	1.10	1.0					
Pressure (PSI)	320	360	375	385	420	8					

inflation volume - 1.00 l inflation pressure - 180 PSI

Plot of Gauge Pressure (PSI) vs. Volume (L)





Westbay

Page ____ of ____

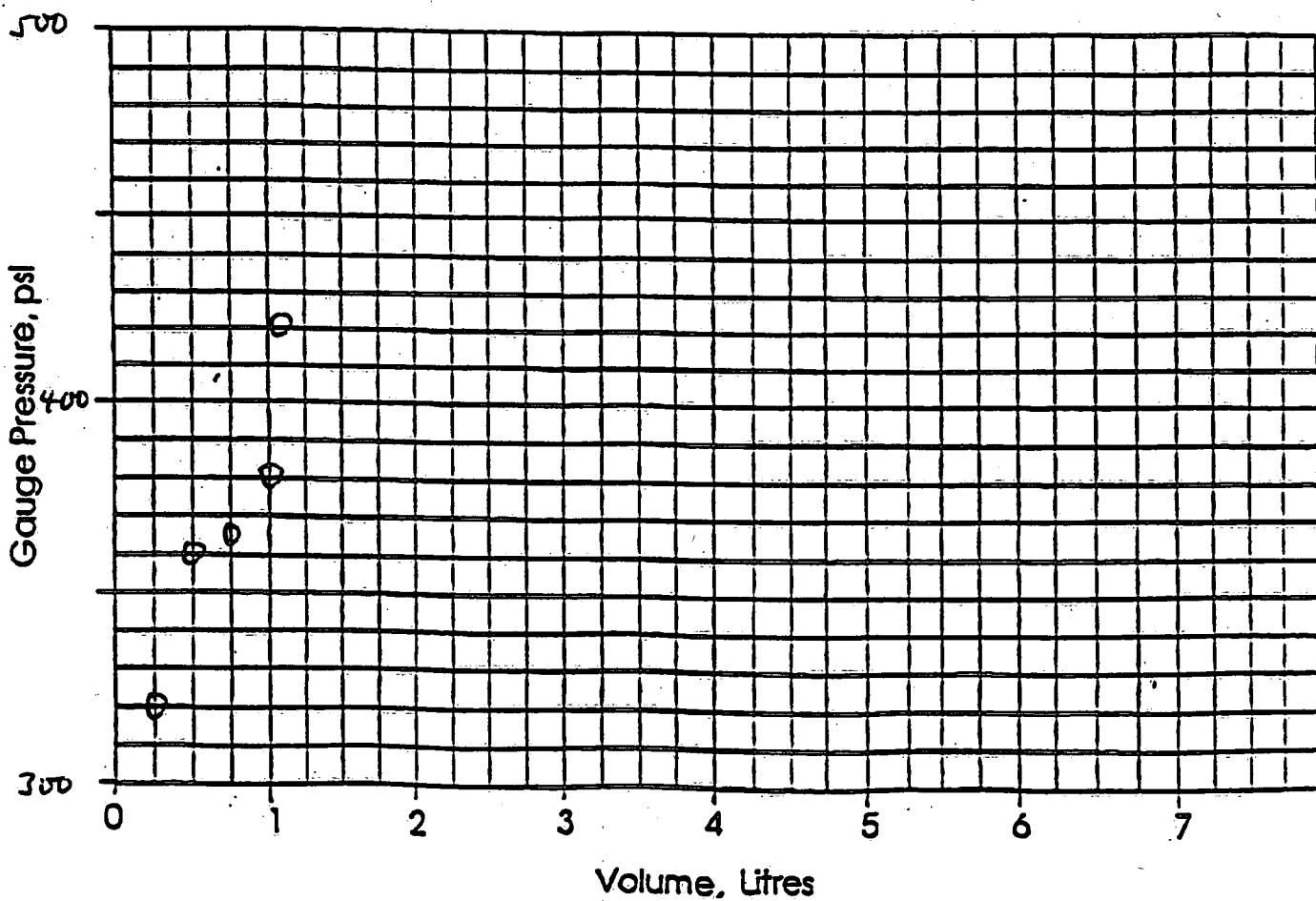
MP Packer Inflation Record

Project: _____ Job number: _____
Location: Smithville Completed by: JV & CT
Hole No.: BH - 37C Date Inflated: May 17/99
Packer No.: 15 Depth(m / ft) _____
Inflation Tool Setting (psi) 240 Depth to Standing Water (m / ft)
- open hole

Volume (Litres)	0.25	0.50	0.75	1.00	1.10	1.05					
Pressure (PSI)	320	360	365	380	420	480					

inflation volume ~ 1.05 l inflation pressure - 180 PSI

Plot of Gauge Pressure (PSI) vs. Volume (L)





Westbay

Page ____ of ____

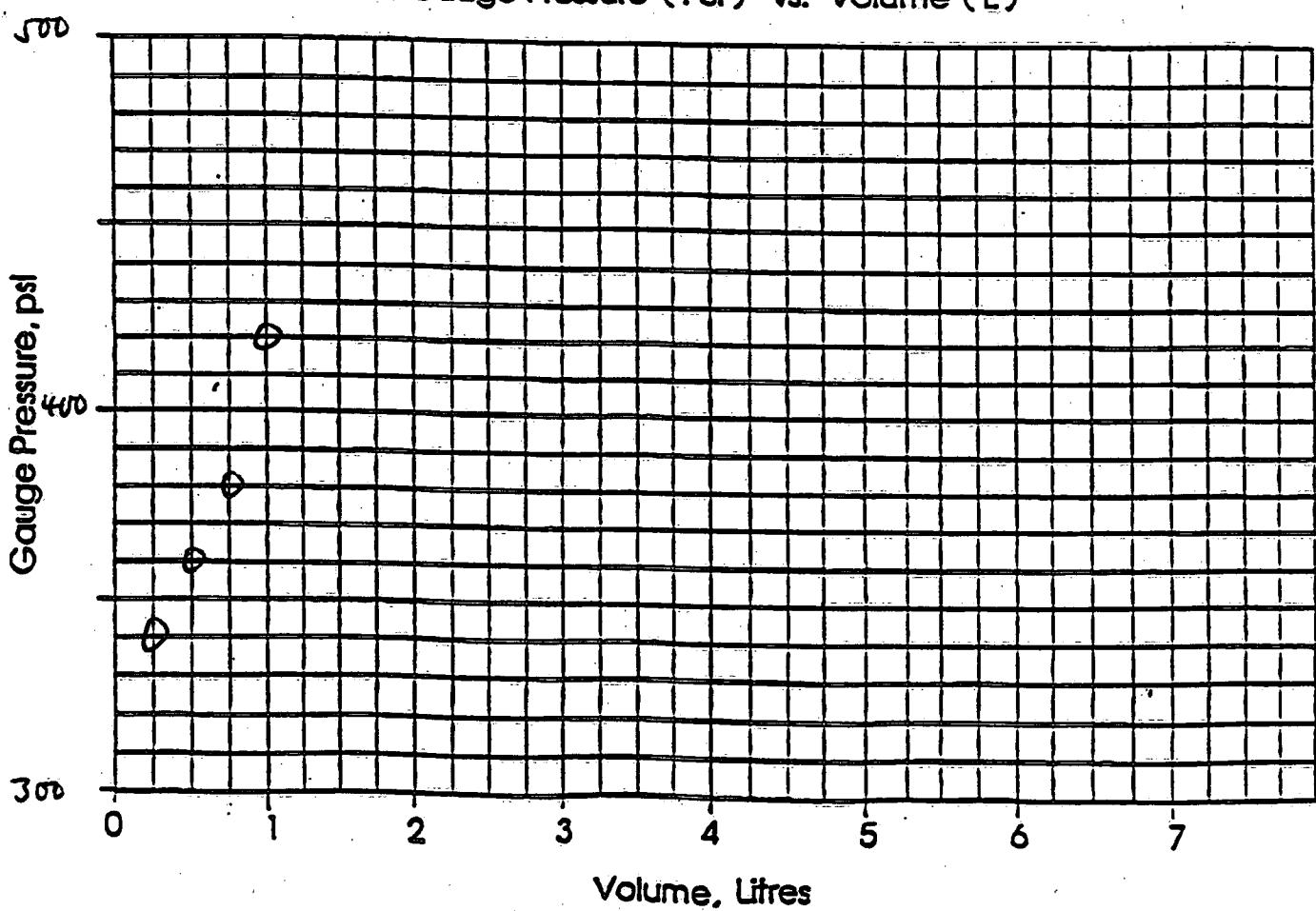
MP Packer Inflation Record

Project: _____ Job number: _____
Location: Smithville Completed by: JV & CT
Hole No.: BH - 37C Date Inflated: May 17/99
Packer No.: 18 Depth(m / ft) _____
Inflation Tool Setting (psi) 240 Depth to Standing Water (m / ft)
- open hole

Volume (Litres)	0.25	0.50	0.75	1.00	0.95							
Pressure (PSI)	340	360	380	420	180							

inflation volume - 0.95 l inflation pressure - 180 PSI

Plot of Gauge Pressure (PSI) vs. Volume (L)





Westbay

Page _____ of _____

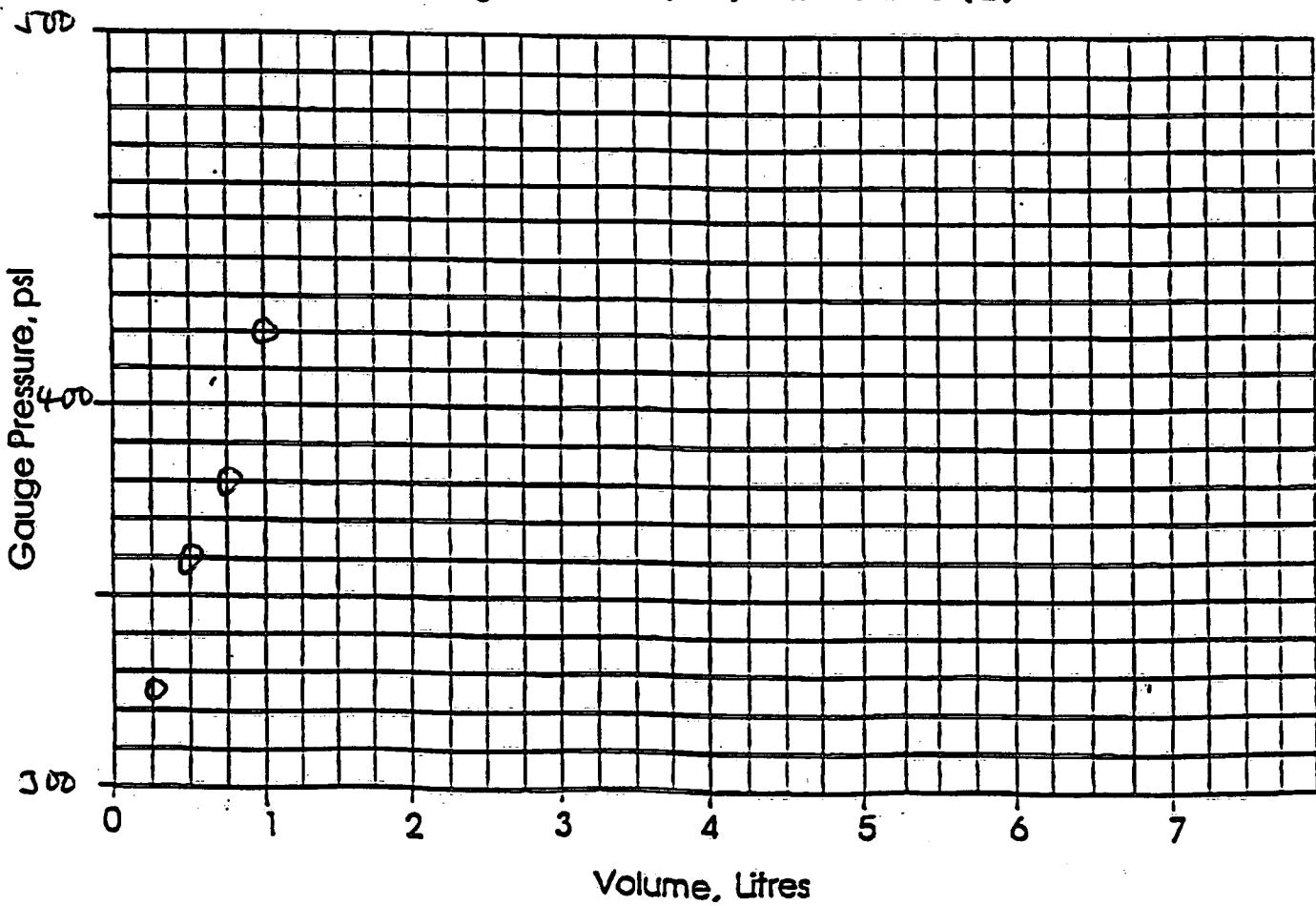
MP Packer Inflation Record

Project: _____ Job number: _____
Location: Smithville Completed by: JV & CT
Hole No.: BH - 37C Date Inflated: May 17/89
Packer No.: 21 Depth(m / ft) _____
Inflation Tool Setting (psi) 240 Depth to Standing Water (m / ft)
- open hole

Volume (Litres)	0.25	0.50	0.75	1.00	0.90						
Pressure (PSI)	325	360	380	420	180						

inflation volume - 0.90 l inflation pressure - 180 PSI

Plot of Gauge Pressure (PSI) vs. Volume (L)





Westbay

Page ____ of ____

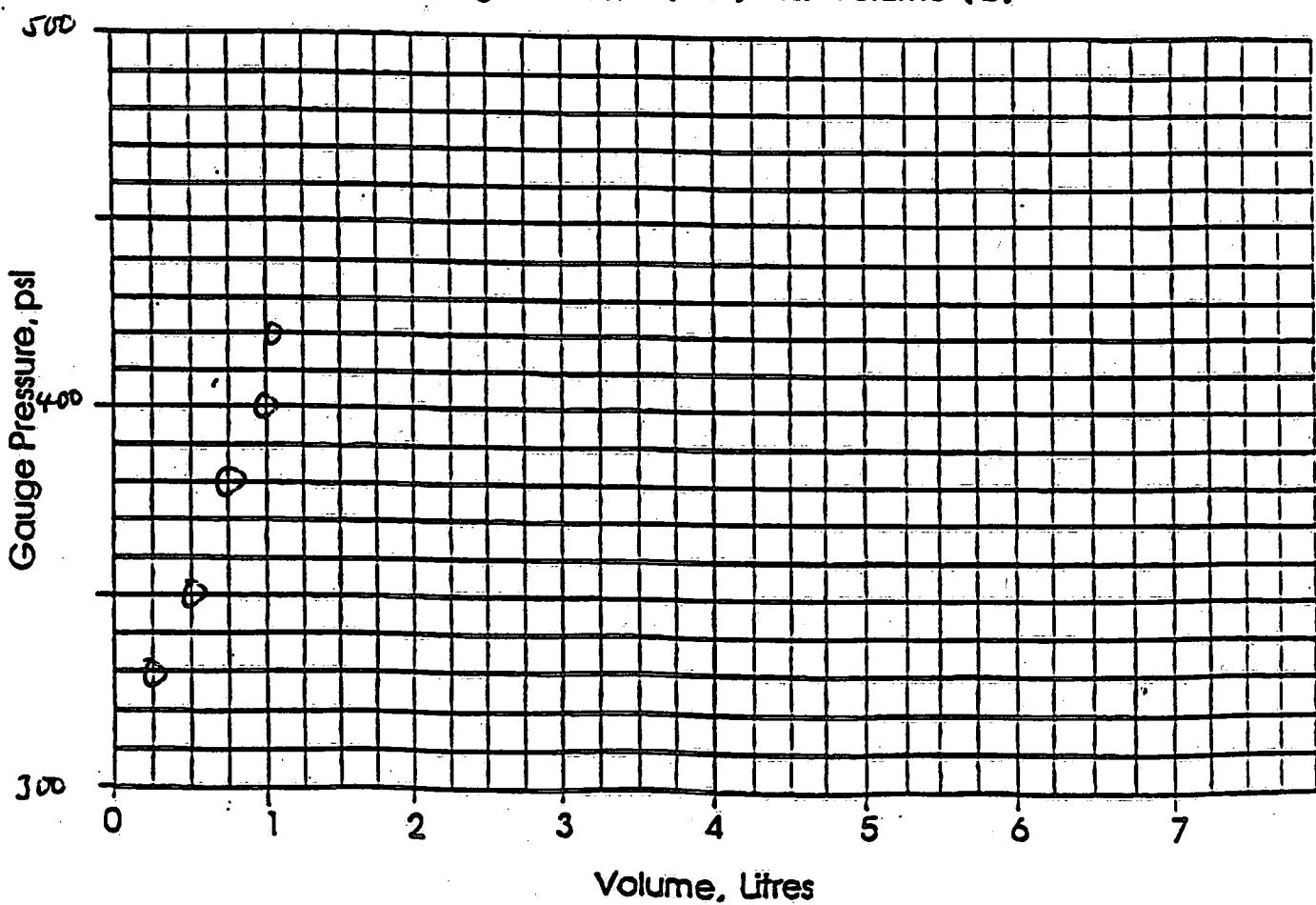
MP Packer Inflation Record

Project: _____ Job number: _____
Location: Smithville Completed by: JV & CT
Hole No.: BH 37C Date Inflated: May 17/89
Packer No.: 24 Depth(m / ft) _____
Inflation Tool Setting (psi) 240 Depth to Standing Water (m / ft)
- open hole

Volume (Litres)	0.25	0.50	0.75	1.00	1.05	1.00					
Pressure (PSI)	330	350	380	400	420	48					

inflation volume - 1.00 l inflation pressure - 180 PSI

Plot of Gauge Pressure (PSI) vs. Volume (L)





Westbay

Page ____ of ____

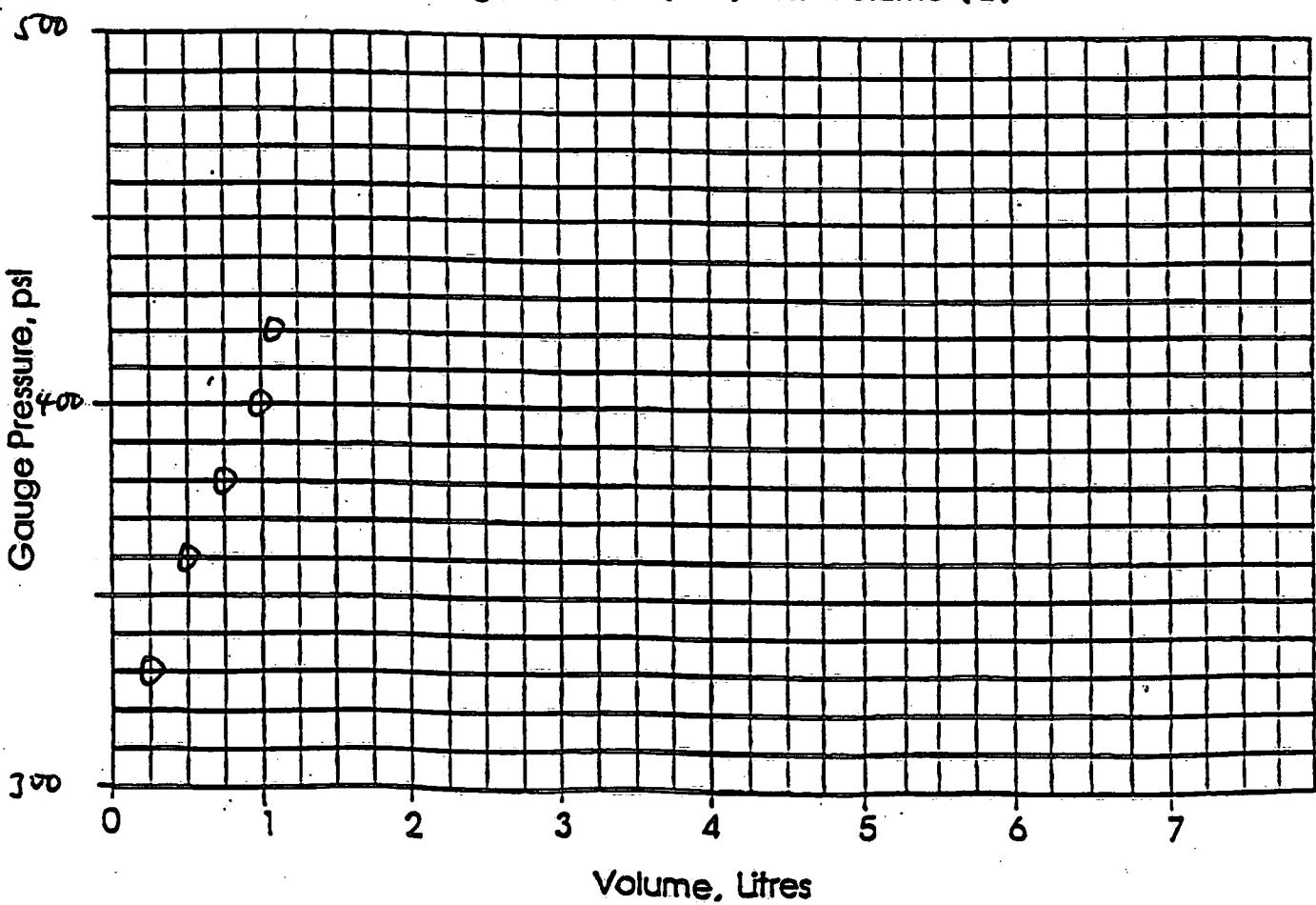
MP Packer Inflation Record

Project: _____ Job number: _____
Location: Smoothville Completed by: JV & CT
Hole No.: OH - 37C Date Inflated: May 17/89
Packer No.: 27 Depth(m / ft) _____
Inflation Tool Setting (psi) 740 PSI Depth to Standing Water (m / ft)
- open hole

Volume (Litres)	0.25	0.50	0.75	1.00	1.10	1.05					
Pressure (PSI)	330	360	380	400	420	480					

inflation volume - 1.05 l inflation pressure - 180 PSI

Plot of Gauge Pressure (PSI) vs. Volume (L)



**Appendix C
Installation Logs for Borehole 64**

Summary Casing Installation Log

Well No. 64
Job No.

Client NWRI
Site Smithville
Project Description 1999

Well Information

Reference Datum

Elevation of Datum 0.00 m.

Position of MP Casing Top above / below Datum 0.00 m. above datum

Position of MP Casing Bottom Below Datum 59.07 m. below datum

Well Description

Other References

Log Information

Designed By JV & PL

Date May 1/99

Approved By PL

Date May 2/99

Checked By JV

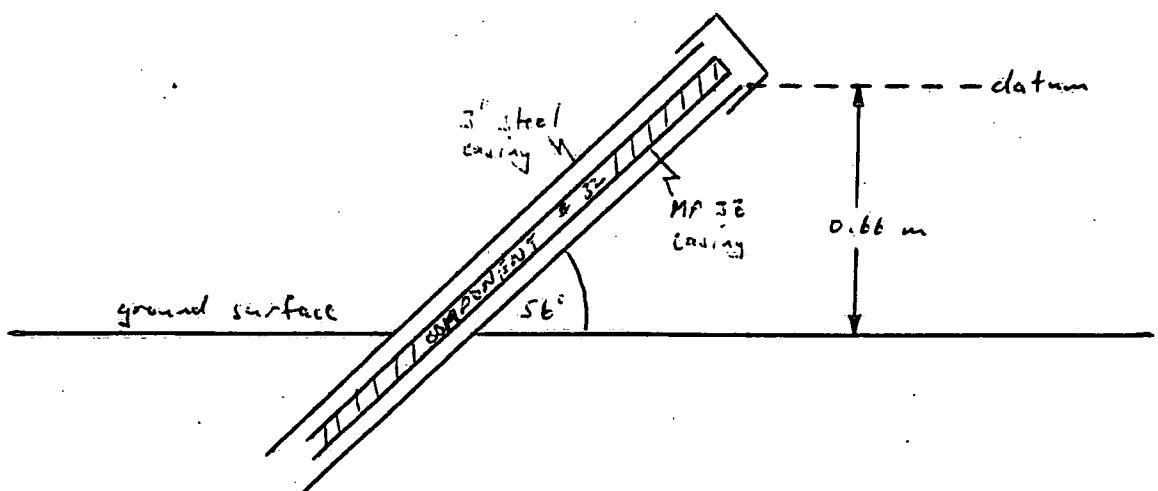
Date May 10/99

Computer File No. 64

Date Fri May 14 14:57:31 1999

Sketch of Wellhead Completion

Trend - 341.5°



Well Designer Report

Job No.

NWRI

Date: Thu May 20 09:51:26 1999

Page: 1

Well No. 64

Scale Meters	Geo 1	Geo 2	Well Casing	MP Log	Tested Ok/Test/Filt	Part Desc.	Serial No.	Comments
0				32	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	MP38 CASING 3 METERS		
				31	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	MP38 CASING 3 METERS		
				30	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	MP38 CASING 3 METERS		
10				29	<input checked="" type="checkbox"/>	MP38 CASING 3 METERS		
	(10) - 11.47	- 13.0		28	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> geotex	MP38 MEASUREMENT PORT MP38 PUMPING PORT MP38 STANDARD PACKER MP38 MEASUREMENT PORT	12634 5292 11510 12633	
	(9)	14.5 - 16.5		27	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> geotex	MP38 CASING 3 METERS	5293	
20	(8)	20.0 21.0		26	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> geotex	MP38 PUMPING PORT MP38 STANDARD PACKER MP38 MEASUREMENT PORT MP38 PUMPING PORT MP38 STANDARD PACKER MP38 MEASUREMENT PORT	11509 12636 5294 11508 12635	
	(7)	22.5 - 25.5		25	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> geotex	MP38 CASING 3 METERS	5295	
30	(6)	27 - 32.0		24	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> geotex	MP38 PUMPING PORT MP38 STANDARD PACKER MP38 MEASUREMENT PORT	11507 12638	
	(5)	33.5 - 38.5		23	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> geotex	MP38 CASING 3 METERS	5328	
40				22	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> geotex	MP38 PUMPING PORT MP38 CASING 1 METER MP38 CASING 1 METER MP38 STANDARD PACKER MP38 MEASUREMENT PORT	11506 12640	
				21	<input checked="" type="checkbox"/>	MP38 CASING 3 METERS	5310	
				20	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> geotex	MP38 PUMPING PORT MP38 STANDARD PACKER MP38 MEASUREMENT PORT	11505 12637	
50	(4)	40.0 46.5		19	<input checked="" type="checkbox"/>	MP38 CASING 3 METERS	5311	
	(3)	48 - 50.5		18	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> geotex	MP38 PUMPING PORT MP38 STANDARD PACKER MP38 MEASUREMENT PORT	11504 12747	
	(2)	52 - 55		17	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> geotex	MP38 CASING 3 METERS	5312	
60	(1)	56.5 - 59.07		16	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> geotex	MP38 CASING 0.5 METERS MP38 STANDARD PACKER MP38 MEASUREMENT PORT MP38 CASING 1.5 METERS MP38 PUMPING PORT MP38 CASING 1 METER MP38 STANDARD PACKER MP38 MEASUREMENT PORT	11500 12639	
				15	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> geotex	MP38 CASING 3 METERS	5313	
				14	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> geotex	MP38 PUMPING PORT MP38 STANDARD PACKER MP38 MEASUREMENT PORT MP38 CASING 1 METER MP38 PUMPING PORT MP38 CASING 1.5 METERS MP38 END CAP (metric)	11501 12748 5314	Last Part in Well



Westbay

Ran Rul - 59.21
Westbay - 59.07

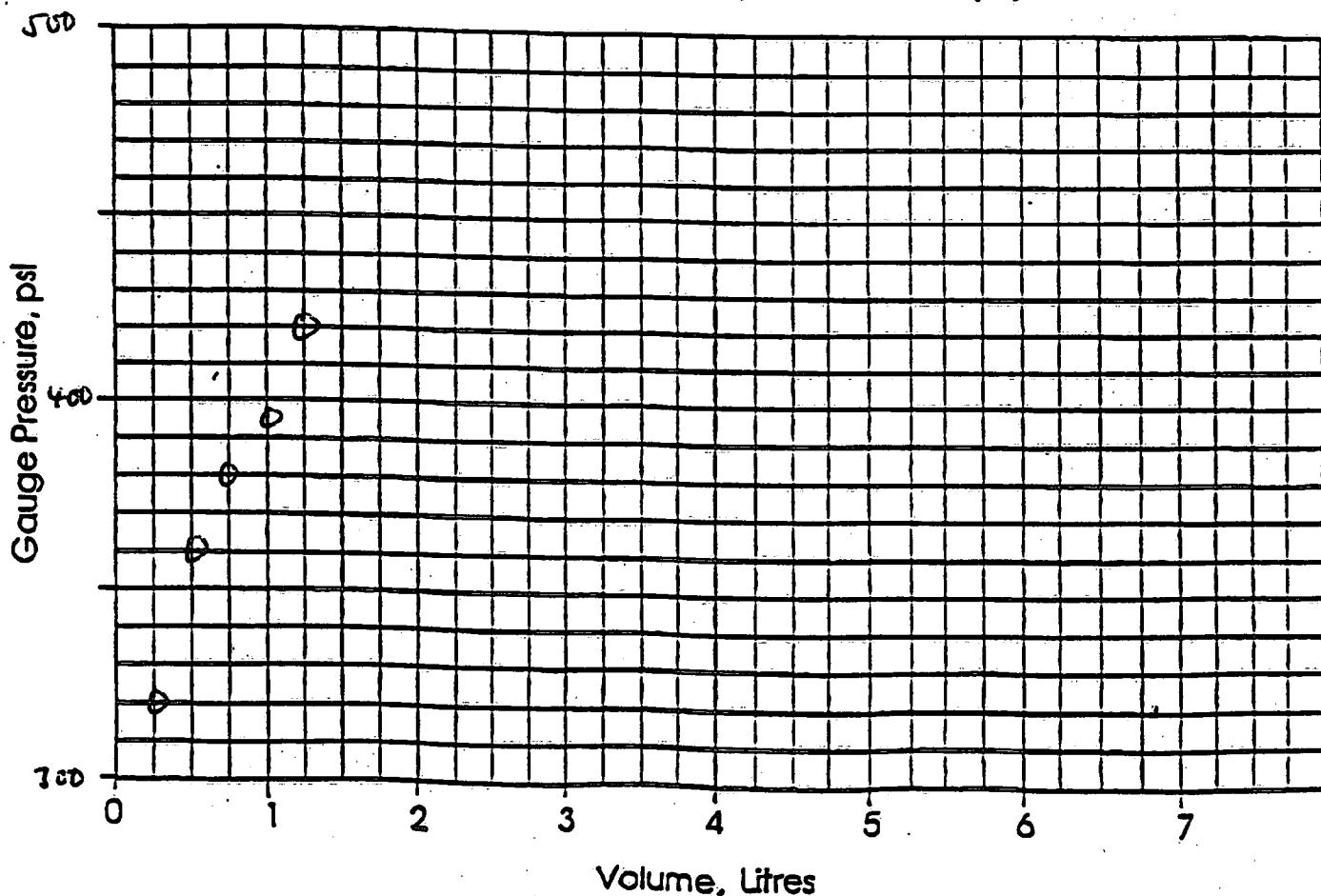
MP Packer Inflation Record

Project: _____ Job number: _____
 Location: Sin, thville Completed by: JV S CT
 Hole No.: SH - 64 Date Inflated: May 19/87
 Packer No.: 3 Depth(m / ft) _____
 Inflation Tool Setting (psi) 240 Depth to Standing Water (m / ft)
 - open hole

Volume (Litres)	0.25	0.50	0.75	1.00	1.25	1.15				
Pressure (PSI)	320	360	380	375	420	61				

final inflation volume = 1.15 l final inflation pressure = 180 PS

Plot of Gauge Pressure (PSI) vs. Volume (L)





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MP Packer Inflation Record

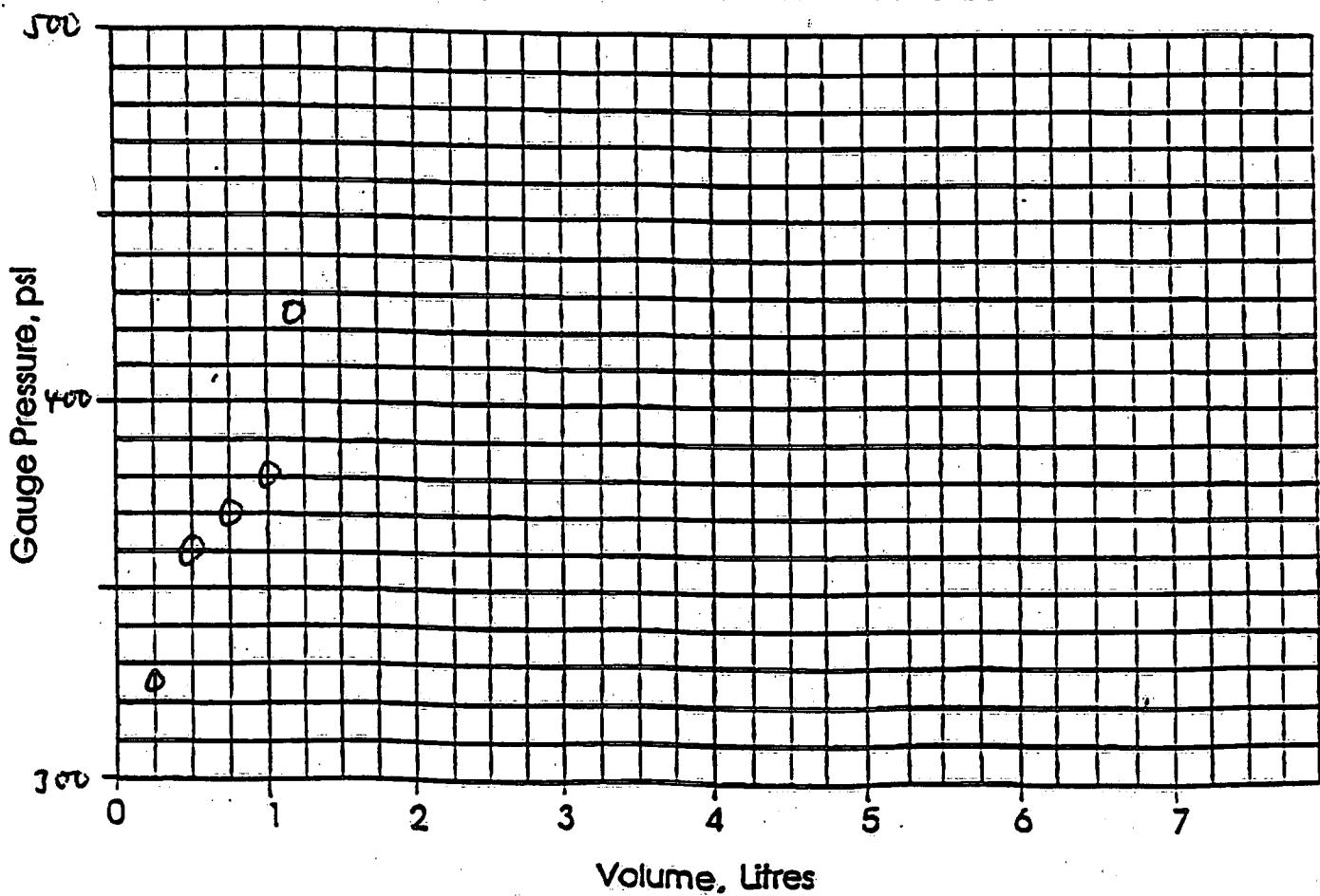
Project: _____ Job number: _____
 Location: Southville Completed by: JV & CT
 Hole No.: BH 64 Date inflated: May 19/99
 Packer No.: 8 Depth(m / ft) _____
 Inflation Tool Setting (psi) 240 Depth to Standing Water (m / ft)
 - open hole

Volume (Litres)	0.25	0.50	0.75	1.00	1.25	1.1					
Pressure (PSI)	325	360	370	380	425	48					

inflation volume - 1.10 l

inflation pressure - 185 PSI

Plot of Gauge Pressure (PSI) vs. Volume (L)





Westbay

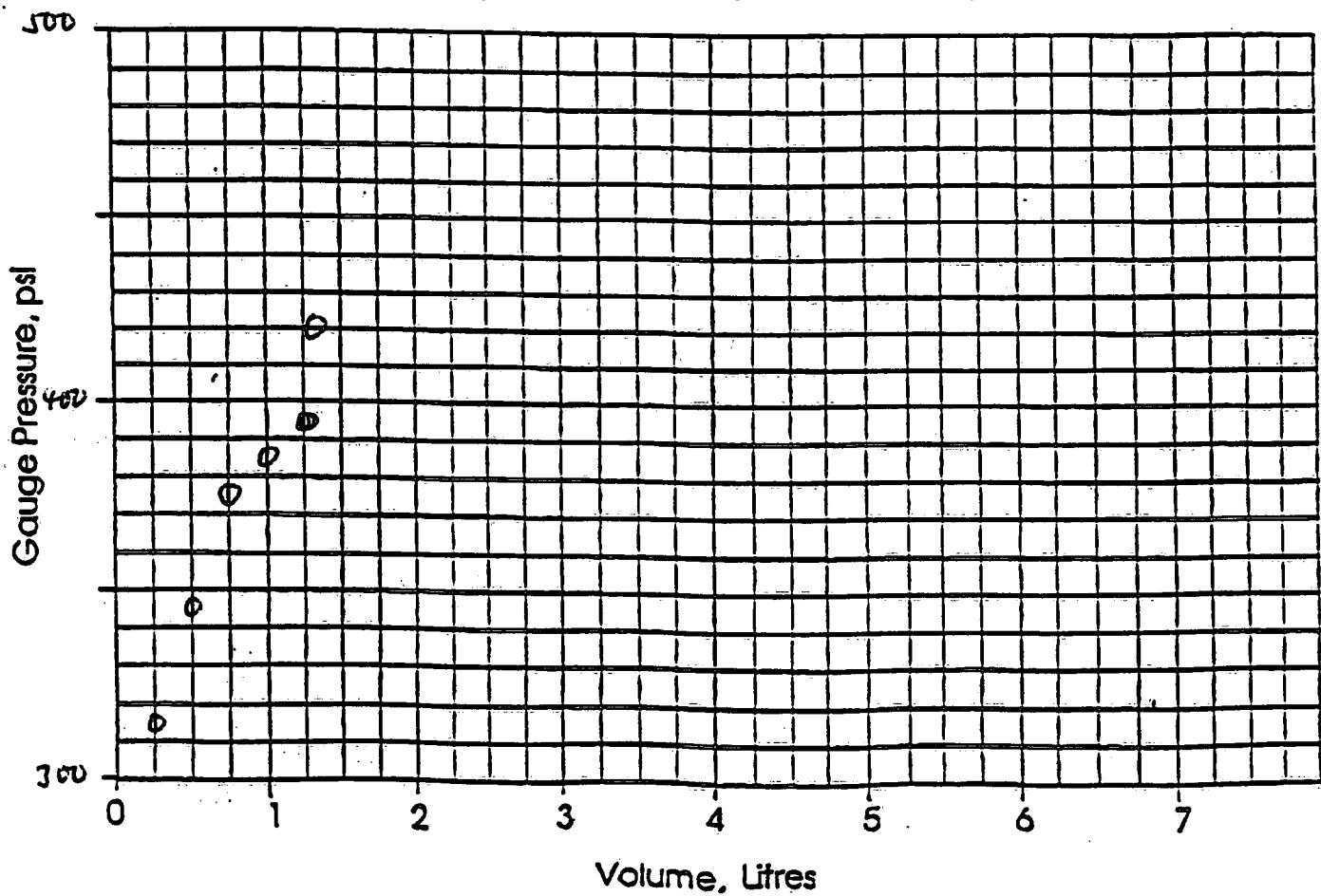
MP Packer Inflation Record

Project: _____ Job number: _____
 Location: Smithville Completed by: JV & CT
 Hole No.: BH 64 Date inflated: 17-7-1989
 Packer No.: 12 Depth(m / ft) _____
 Inflation Tool Setting (psi) 240 Depth to Standing Water (m / ft)
 - open hole

Volume (Litres)	0.25	0.50	0.75	1.00	1.25	1.35	1.25			
Pressure (PSI)	315	345	375	385	395	400	X			

inflation volume - 1.25 l inflation pressure - 180 PSI

Plot of Gauge Pressure (PSI) vs. Volume (L)





Westbay

Page ____ of ____

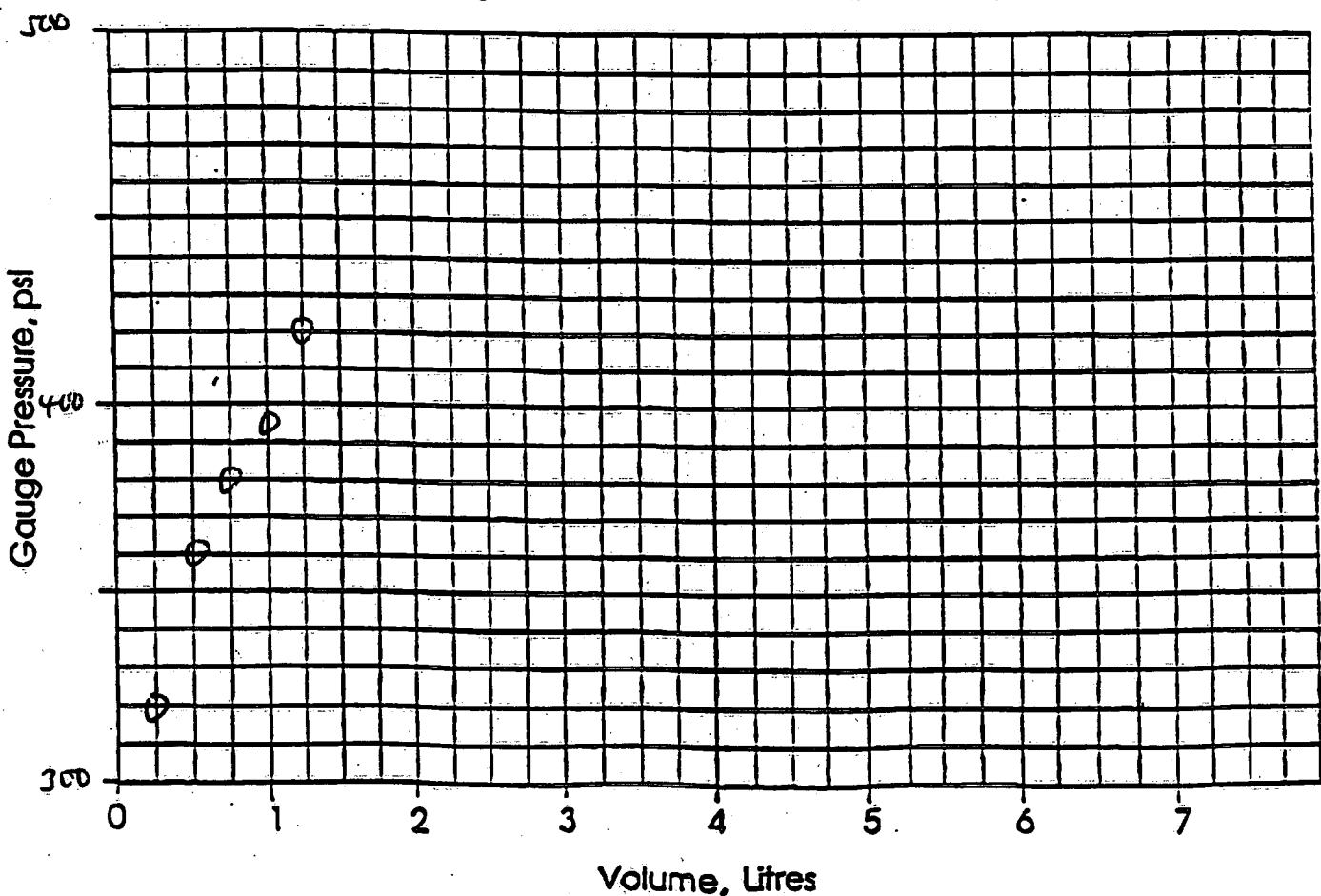
MP Packer Inflation Record

Project: _____ Job number: _____
Location: Smithville Completed by: JV & CT
Hole No.: B11-64 Date Inflated: May 19/99
Packer No.: 11 Depth(m / ft) _____
Inflation Tool Setting (psi) 240 Depth to Standing Water (m / ft)
- open hole

Volume (Litres)	0.25	0.50	0.75	1.00	1.25	1.15					
Pressure (PSI)	320	360	380	395	420	180					

inflation volume - 1.15 l inflation pressure - 180 PSI

Plot of Gauge Pressure (PSI) vs. Volume (L)



12/6/99



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MP Packer Inflation Record

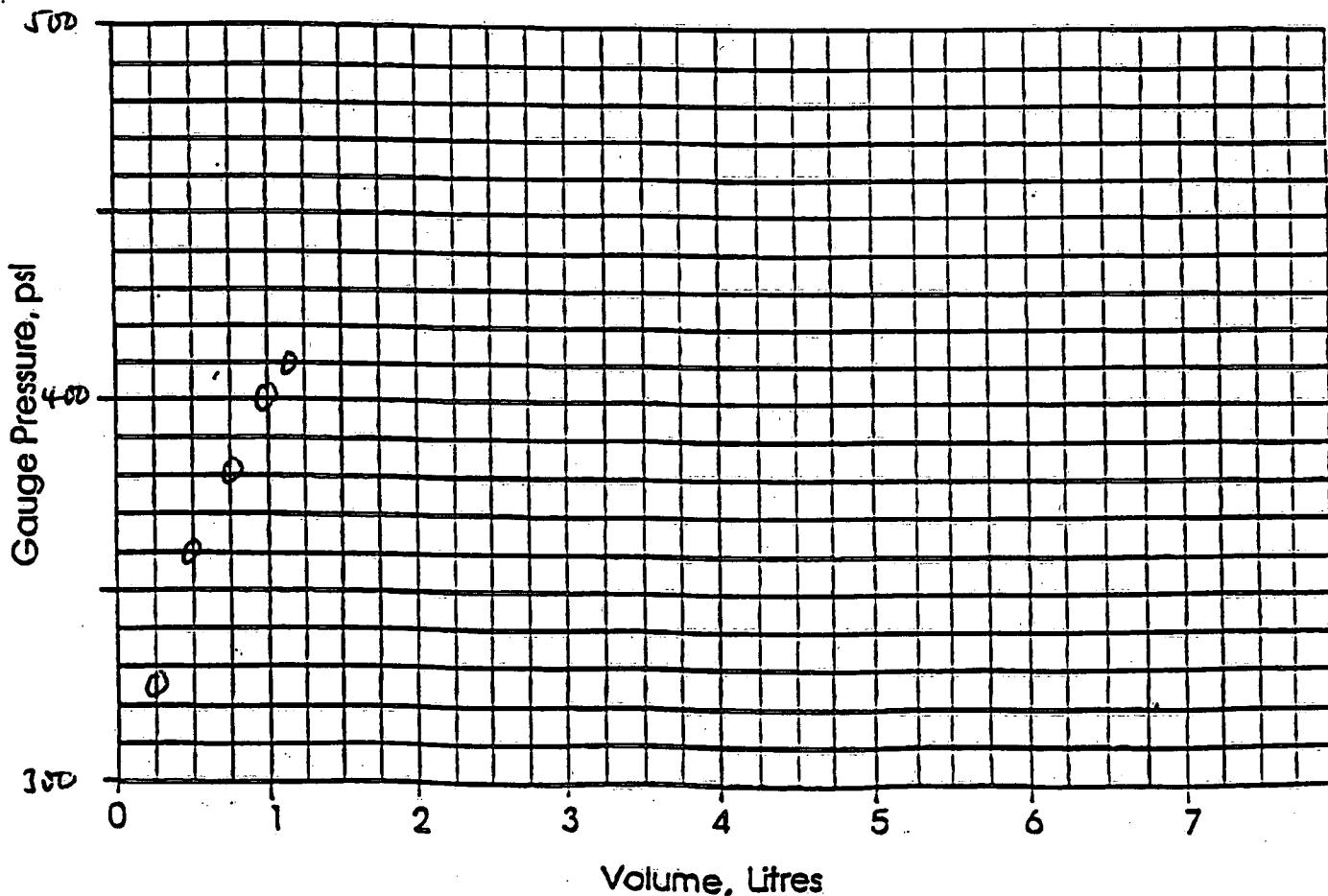
Project: _____ Job number: _____
Location: Sun, Thiville Completed by: JV & CT
Hole No.: BH 64 Date Inflated: Nov 19/98
Packer No.: 20 Depth(m / ft) _____
Inflation Tool Setting (psi) 240 Depth to Standing Water (m / ft)
- open hole

Volume (Litres)	0.25	0.50	0.75	1.00	1.20	1.15					
Pressure (PSI)	325	360	370	400	410	✓					

inflation volume - 1.15 l

inflation pressure - 170 PSI

Plot of Gauge Pressure (PSI) vs. Volume (L)





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MP Packer Inflation Record

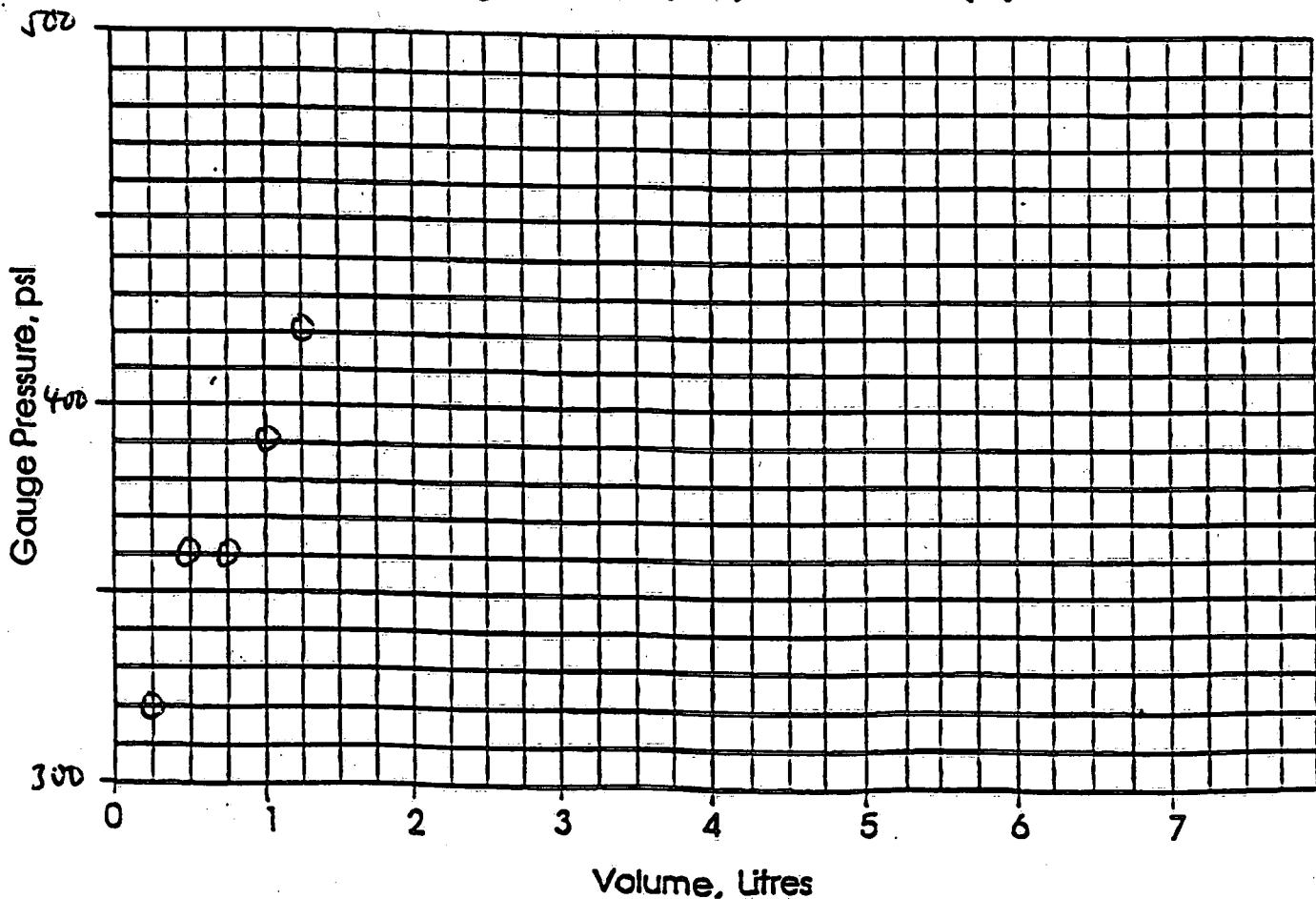
Project: _____ Job number: _____
Location: Summitville Completed by: JV & CT
Hole No.: RH 64 Date Inflated: May 19/99
Packer No.: 22 Depth(m / ft) _____
Inflation Tool Setting (psi) 240 Depth to Standing Water (m / ft)
- open hole

Volume (Litres)	0.25	0.50	0.75	1.00	1.25	1.15					
Pressure (PSI)	320	360	360	390	420	Ø					

inflation volume - 1.15 l

inflation pressure - 180 PSI

Plot of Gauge Pressure (PSI) vs. Volume (L)





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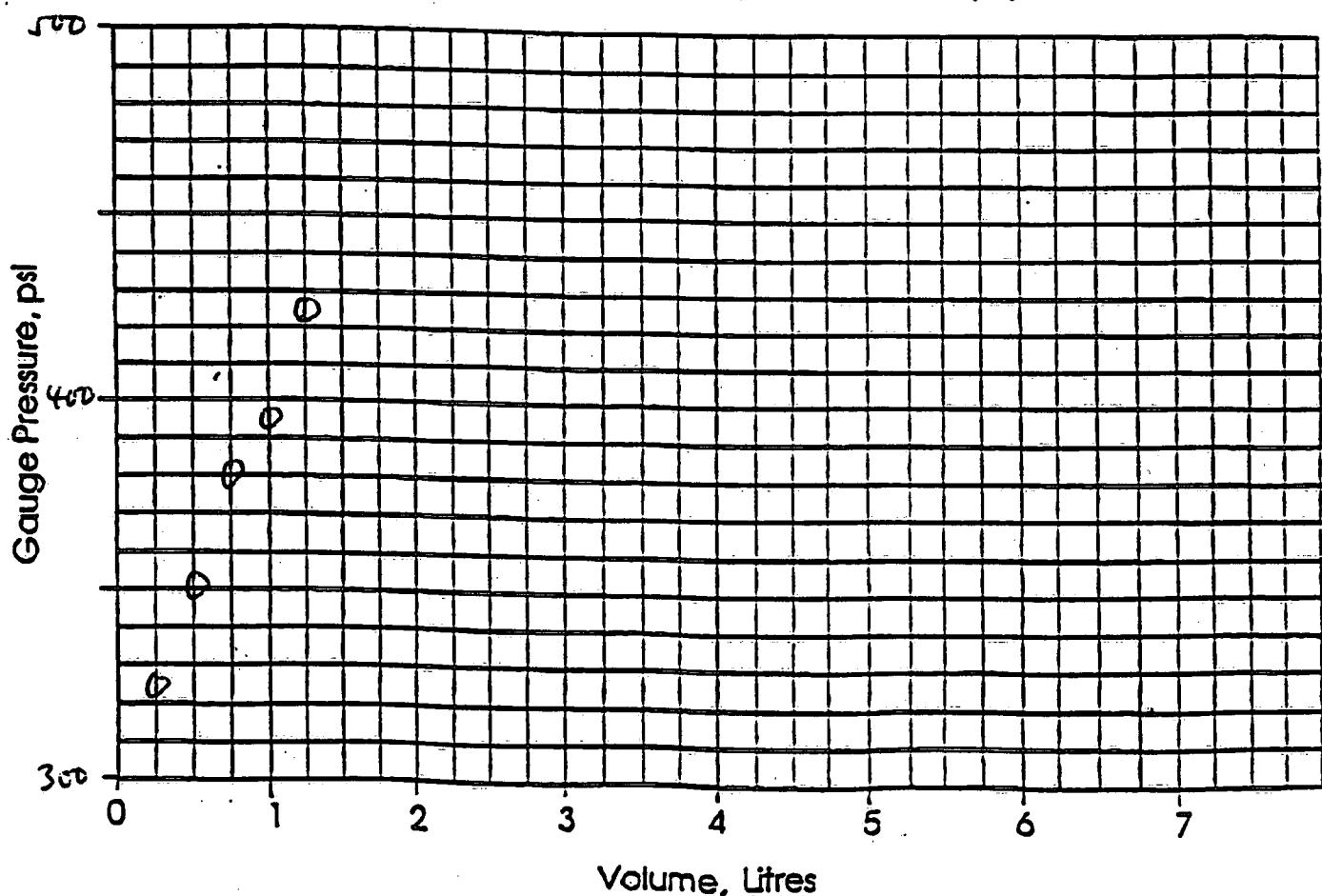
MP Packer Inflation Record

Project: _____ Job number: _____
Location: Sunthville Completed by: JW & CT
Hole No.: BH 64 Date Inflated: 17/7/89
Packer No.: 24 Depth(m / ft) _____
Inflation Tool Setting (psi) 240 Depth to Standing Water (m / ft)
- open hole

Volume (Litres)	0.25	0.50	0.75	1.00	1.25	1.50					
Pressure (PSI)	325	350	380	395	425	450					

inflation volume - 1.20 l inflation pressure - 185 PSI

Plot of Gauge Pressure (PSI) vs. Volume (L)





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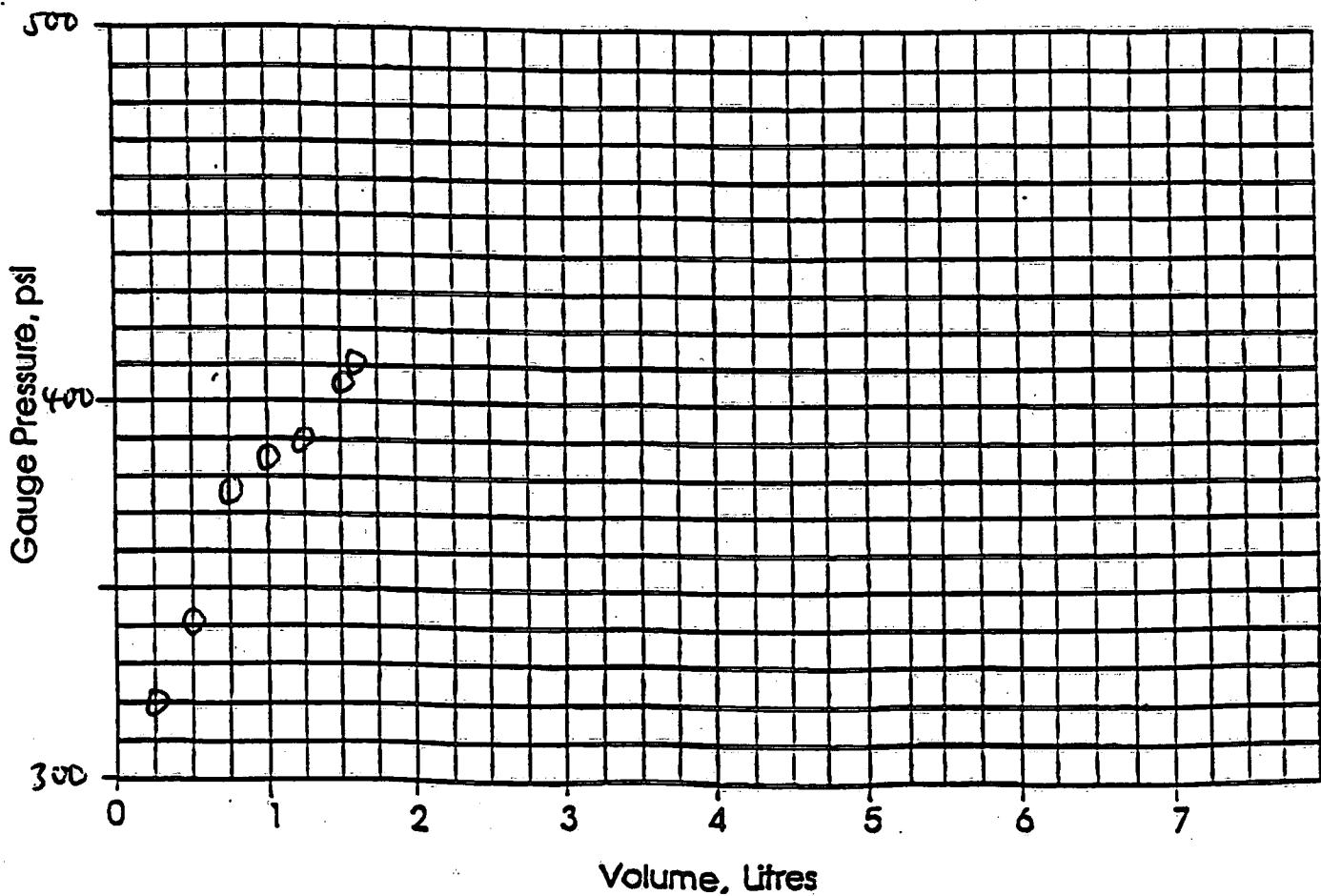
MP Packer Inflation Record

Project: _____ Job number: _____
Location: Smithville Completed by: JV & CT
Hole No.: B14 64 Date inflated: May 19/99
Packer No.: 27 Depth(m / ft) _____
Inflation Tool Setting (psi) 240 Depth to Standing Water (m / ft)
- open hole

Volume (Litres)	0.25	0.50	0.75	1.00	1.25	1.50	1.60	1.55		
Pressure (PSI)	320	340	375	385	390	405	410	41		

inflation volume - 1.55 l inflation pressure - 170 PSI

Plot of Gauge Pressure (PSI) vs. Volume (L)



**Appendix D
Installation Logs for Borehole 66**

Summary Casing Installation Log

Well No. 66
Job No.

Client Environment Canada
Site Smithville
Project Description Regional Wells

Well Information

Reference Datum

Elevation of Datum 0.00 m.

Position of MP Casing Top above / below Datum 0.00 m. above datum

Position of MP Casing Bottom Below Datum 57.07 m. below datum

Well Description

Other References

Log Information

Designed By JV & PL

Date May 1/99

Approved By PL

Date May 2/99

Checked By JV

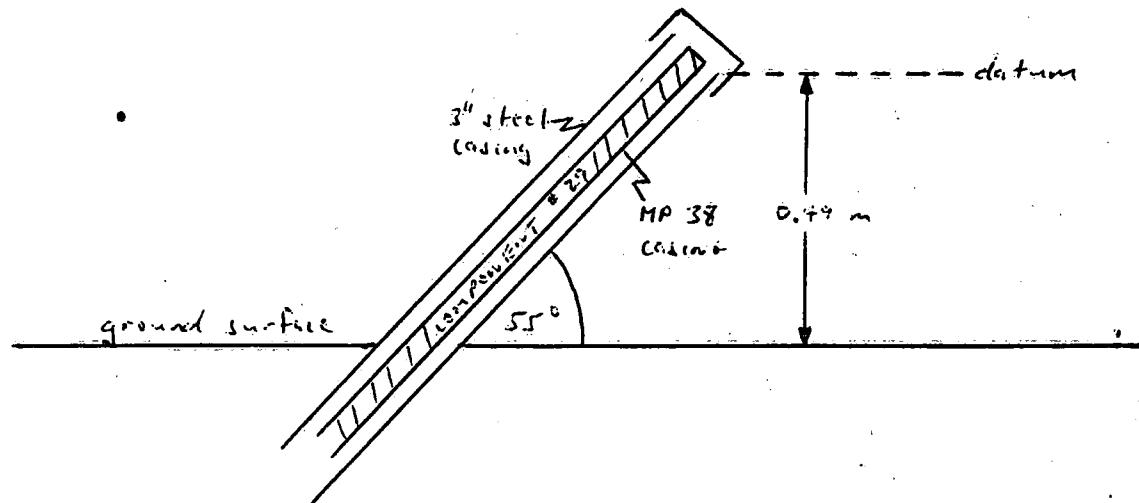
Date May 10/99

Computer File No. 66

Date Fri May 07 16:12:05 1999

Sketch of Wellhead Completion

Trend - 32.4°



Westbay Instruments Inc.

#115-949 W. Third Street, North Vancouver, B.C., Canada V7P-3P7
Phone: [604] 984-4215 • [800] 663-8770 • Fax [604] 984-3536

Report of Well

66

FOR: Environment Canada

DESCRIPTION:

DESIGNED BY: J. S. E.

WELL INFORMATION:

DEPTH: 57.04 m. TOP OF MP: 0.00 m. ELEVATION: 0.00 m.
WELL USING: Nominal Lengths

COMPONENTS

DESCRIPTION	PART NUMBER	QUANTITY
MP38 CASING 0.5 METERS	0225M05	001
MP38 CASING 3 METERS	0225M30	012
MP38 STANDARD PACKER	0236M15	007
MP38 CASING 1 METER	0225M10	007
MP38 CASING 1.5 METERS	0225M15	002
MP38 END CAP (metric)	0223	001
MP38 REGULAR COUPLING	0221	013
MP38 MEASUREMENT PORT	0222	008
MP38 PUMPING PORT	0224	008

Well Designer Report
Job No. E

Date: Thu M
Environment Canada

Date: Thu May 20 09:36:37 1999

Page: 1

Well No. 56

Scale Meters	Geo 1	Geo 2	Well Casing	MP Log	Tested Ok/Test/Filt	Part Desc.	Serial No.	Comments
0						MP38 CASING 0.5 METERS		
				29	<input checked="" type="checkbox"/>	MP38 CASING 3 METERS		
				28	<input checked="" type="checkbox"/>	MP38 CASING 3 METERS		
				27	<input checked="" type="checkbox"/>	MP38 CASING 3 METERS		
				26	<input checked="" type="checkbox"/>	MP38 CASING 3 METERS		
				25	<input checked="" type="checkbox"/>	MP38 CASING 3 METERS		
				24	<input checked="" type="checkbox"/>	MP38 CASING 3 METERS		
	(8)	8.22 - 18.0		23	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> geotex	MP38 MEASUREMENT PORT	12665	
	(7)	19.5 - 20.5		22	<input checked="" type="checkbox"/>	MP38 CASING 3 METERS	5320	
	(6)	22 - 23		21	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> geotex	MP38 PUMPING PORT	11515	
				20	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> geotex	MP38 STANDARD PACKER	12667	
				19	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> geotex	MP38 MEASUREMENT PORT	5327	
				18	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> geotex	MP38 BURPING PORT	11520	
				17	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> geotex	MP38 STANDARD PACKER	12628	
				16	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> geotex	MP38 MEASUREMENT PORT	5329	
				15	<input checked="" type="checkbox"/>	MP38 CASING 3 METERS	11516	
				14	<input checked="" type="checkbox"/>	MP38 PUMPING PORT	5300	
				13	<input checked="" type="checkbox"/>	MP38 CASING 3 METERS		
				12	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	MP38 STANDARD PACKER	11518	
				11	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> geotex	MP38 MEASUREMENT PORT	12630	
				10	<input checked="" type="checkbox"/>	MP38 CASING 3 METERS		
				9	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	MP38 PUMPING PORT	5301	
				8	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> geotex	MP38 CASING 3 METERS		
				7	<input checked="" type="checkbox"/>	MP38 CASING 1 METER	11517	
				6	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> geotex	MP38 STANDARD PACKER	12631	
				5	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> geotex	MP38 MEASUREMENT PORT	5306	
				4	<input checked="" type="checkbox"/>	MP38 CASING 1.5 METERS	11516	
				3	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> geotex	MP38 BURPING PORT	12632	
	(2)	44.5 - 53.5			<input checked="" type="checkbox"/>	MP38 CASING 1 METER	486L	
	(1)	55 - 57.07			<input checked="" type="checkbox"/>	MP38 CASING 1.5 METERS		
				51.67	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> geotex	MP38 STANDARD PACKER	9724	
					<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> geotex	MP38 MEASUREMENT PORT	12471	
					<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> geotex	MP38 BURPING PORT	1203	
					<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> geotex	MP38 PUMPING PORT		
					<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> geotex	MP38 END CAP (metric)		Last Part in ..



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Page ____ of ____

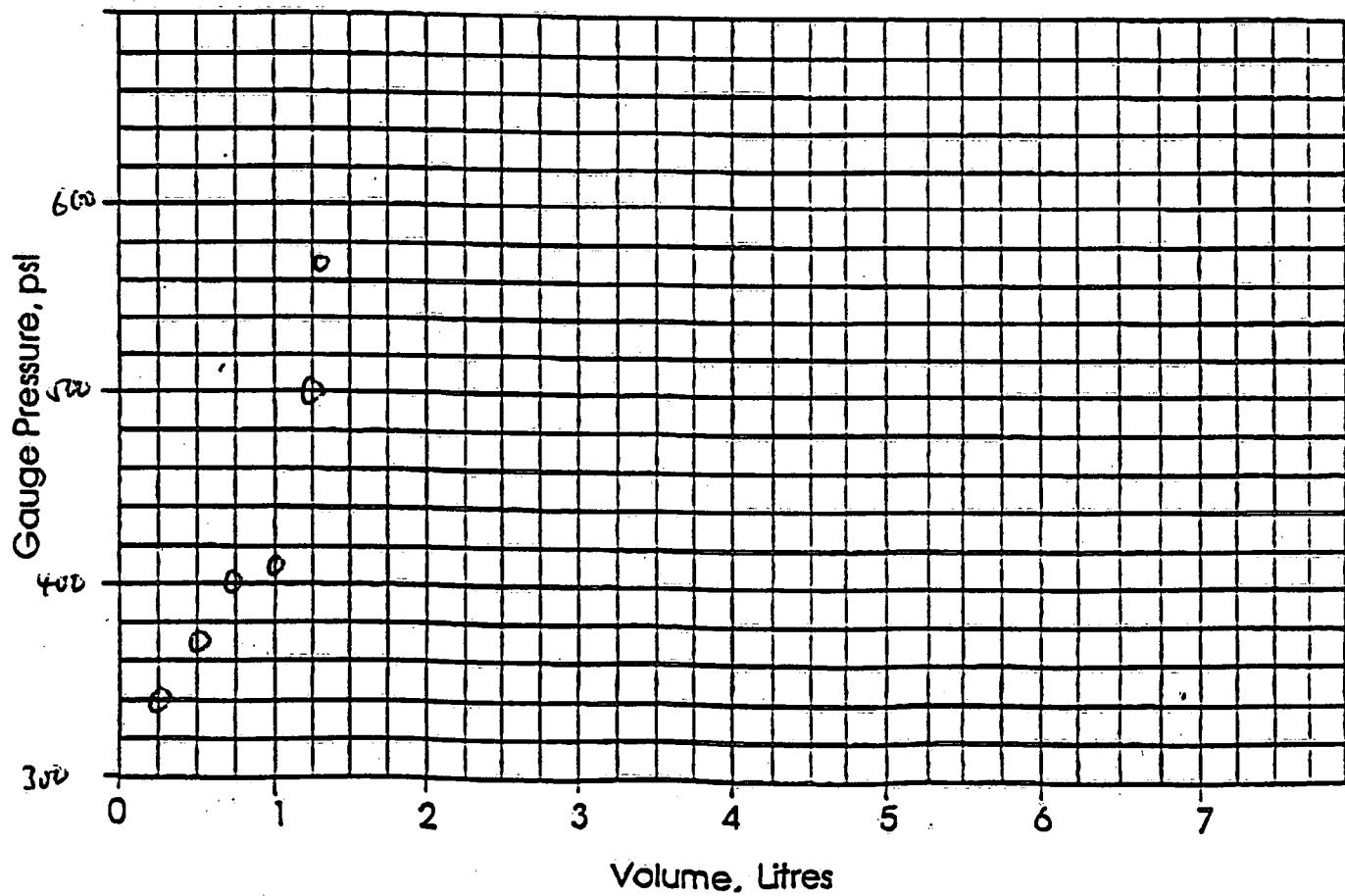
MP Packer Inflation Record

Project: _____ Job number: _____
Location: S. Thiville Completed by: JV & CT
Hole No.: BH - 66 Date Inflated: May 12 / 93
Packer No.: 3 Depth(m / ft) _____
Inflation Tool Setting (psi) 380 Depth to Standing Water (m / ft)
- open hole

Volume (Litres)	0.25	0.50	0.75	1.00	1.25	1.30	1.1				
Pressure (PSI)	340	370	400	410	500	570	68				

final injection volume - 1.10 l final injection pressure - 190 PSI

Plot of Gauge Pressure (PSI) vs. Volume (L)





Westbay

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MP Packer Inflation Record

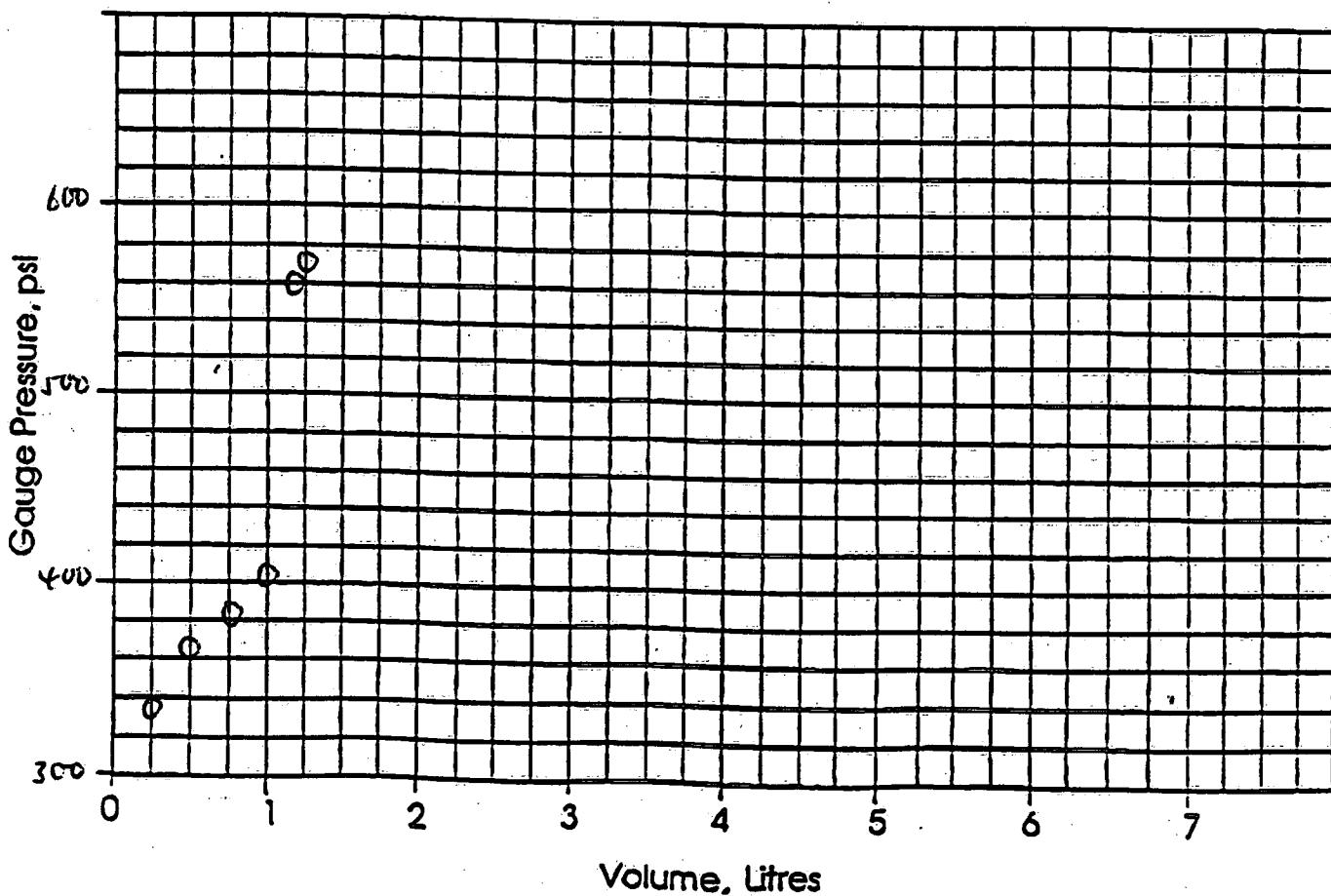
Project: _____ Job number: _____
Location: Smithville Completed by: JV & CT
Hole No.: BH - 66 Date Inflated: May 12/99
Packer No.: 8 Depth(m / ft) _____
Inflation Tool Setting (psi) 380 Depth to Standing Water (m / ft)
- open hole

Volume (Litres)	0.25	0.50	0.75	1.0	1.25	1.50	1.75				
Pressure (PSI)	335	365	385	405	560	570	68				

inflation volume - 1.10 L

inflation pressure - 190 PSI

Plot of Gauge Pressure (PSI) vs. Volume (L)





Westbay

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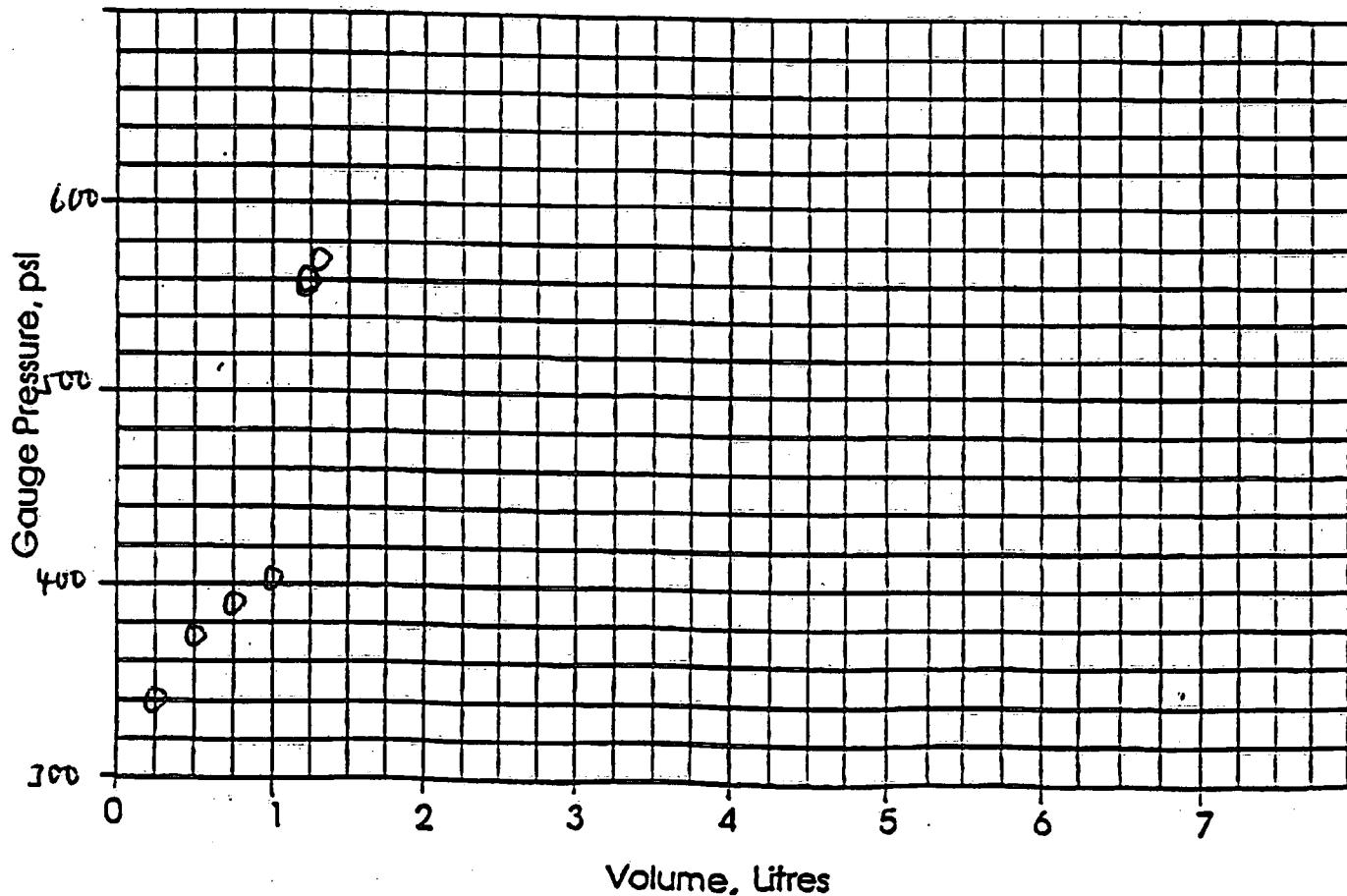
MP Packer Inflation Record

Project: _____ Job number: _____
Location: Sun, Thville Completed by: JV & CT
Hole No.: BH - 66 Date Inflated: May 12/97
Packer No.: 11 Depth(m / ft) _____
Inflation Tool Setting (psi) 380 Depth to Standing Water (m / ft)
- open hole

Volume (Litres)	0.25	0.50	0.75	1.00	1.20	1.25	1.30	1.25		
Pressure (PSI)	340	375	390	405	560	570	570	570	Ø	

inflation volume - 1.25 l. inflation pressure - 190 PSI

Plot of Gauge Pressure (PSI) vs. Volume (L)





Westbay

Page ____ of ____

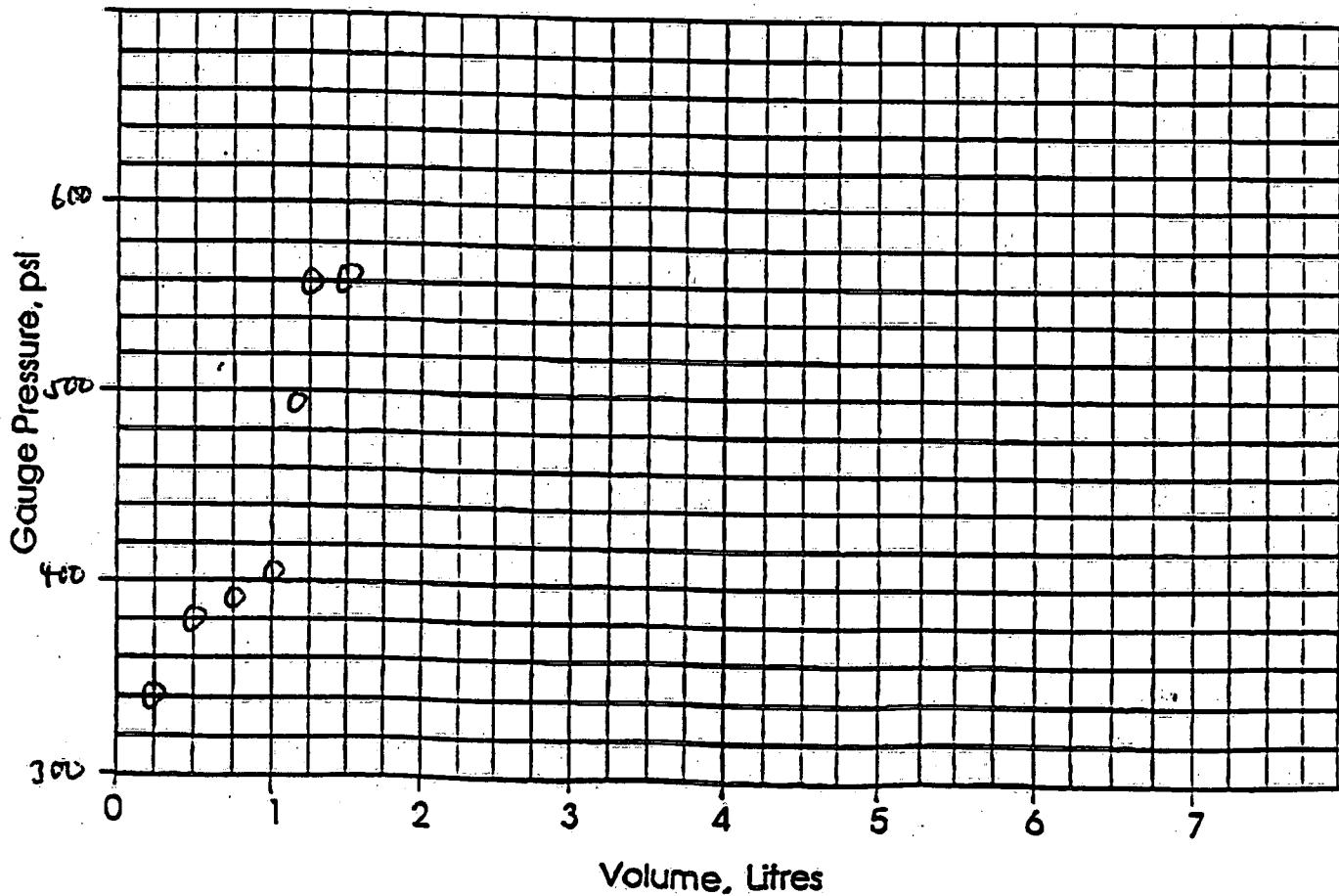
MP Packer Inflation Record

Project: _____ Job number: _____
Location: Smithville Completed by: JV & CT
Hole No.: B14 - 66 Date Inflated: May 12 / 99
Packer No.: 15 Depth(m / ft) _____
Inflation Tool Setting (psi) 380 Depth to Standing Water (m / ft)
- open hole

Volume (Litres)	0.25	0.50	0.75	1.00	1.15	1.25	1.50	1.4		
Pressure (PSI)	340	380	390	405	495	560	580	Ø		

inflation volume 1.40 l inflation pressure - 180 PSI

Plot of Gauge Pressure (PSI) vs. Volume (L)





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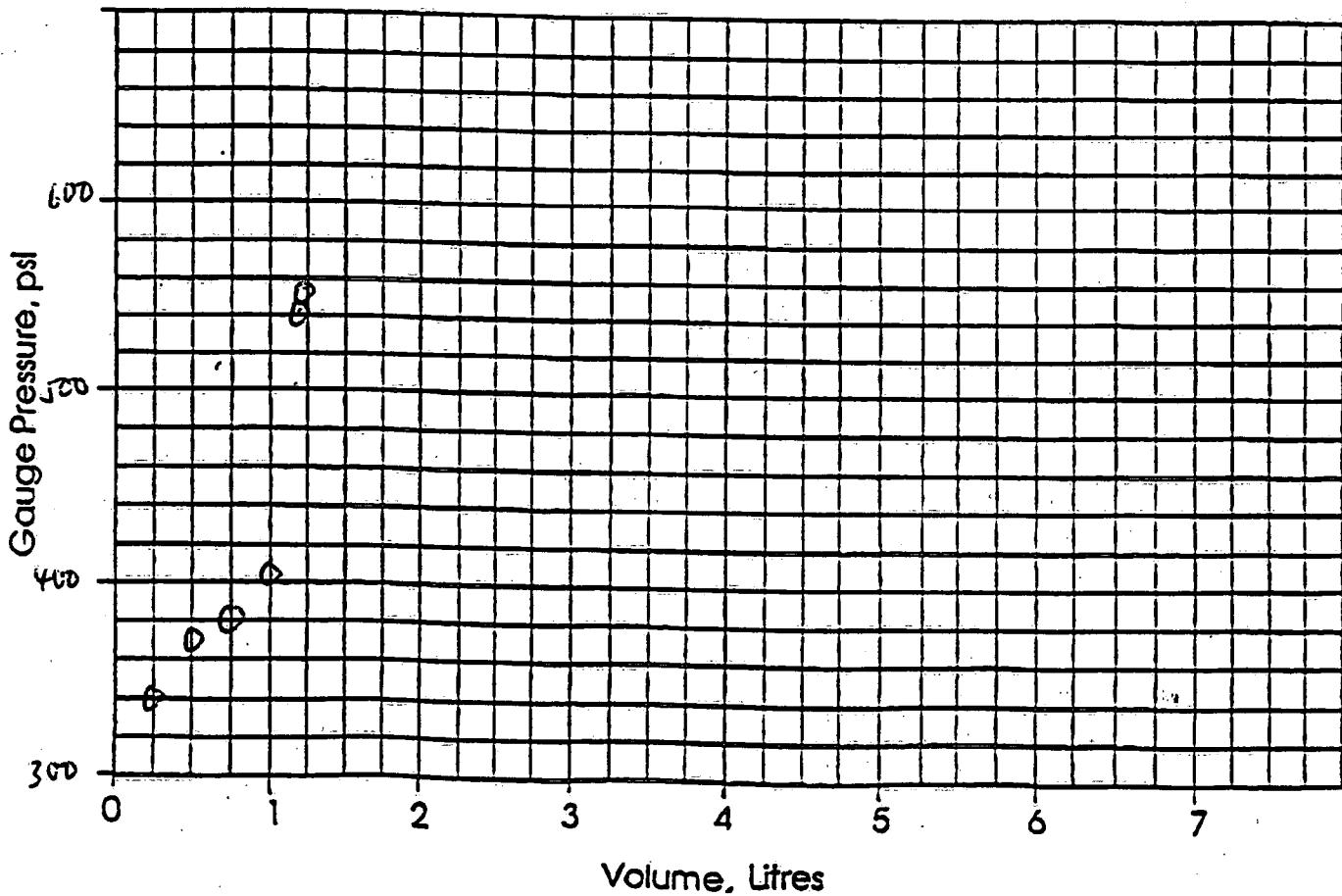
MP Packer Inflation Record

Project: _____ Job number: _____
Location: Smithville Completed by: JV & CT
Hole No.: B14-66 Date Inflated: May 12/97
Packer No.: 18 Depth(m/ft) _____
Inflation Tool Setting (psi) 380 Depth to Standing Water (m/ft)
- open hole

Volume (Litres)	0.25	0.50	0.75	1.00	1.20	1.20	1.1				
Pressure (PSI)	340	370	380	405	540	550	6				

inflation volume - 1.10 l inflation pressure - 170 PSI

Plot of Gauge Pressure (PSI) vs. Volume (L)





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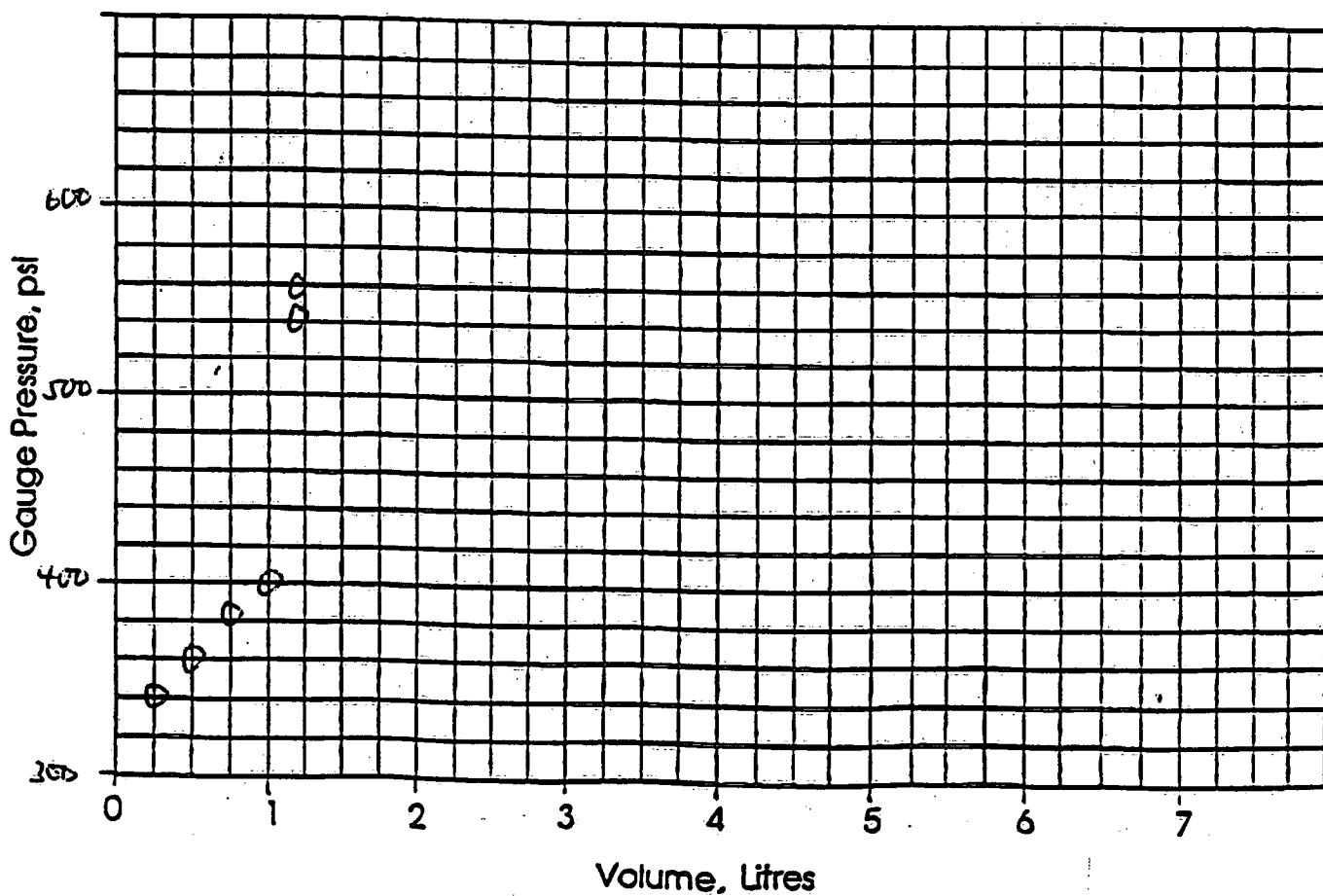
MP Packer Inflation Record

Project: _____ Job number: _____
Location: Smithville Completed by: JV & CT
Hole No.: BH-66 Date Inflated: May 12/99
Packer No.: 20 Depth(m/ft) _____
Inflation Tool Setting (psi) 380 Depth to Standing Water (m/ft)
- open hole

Volume (Litres)	0.25	0.50	0.75	1.00	1.20	1.20	1.1				
Pressure (PSI)	340	360	385	400	540	560	60				

inflation volume - 1.10 l inflation pressure - 180 PSI

Plot of Gauge Pressure (PSI) vs. Volume (L)



12/99



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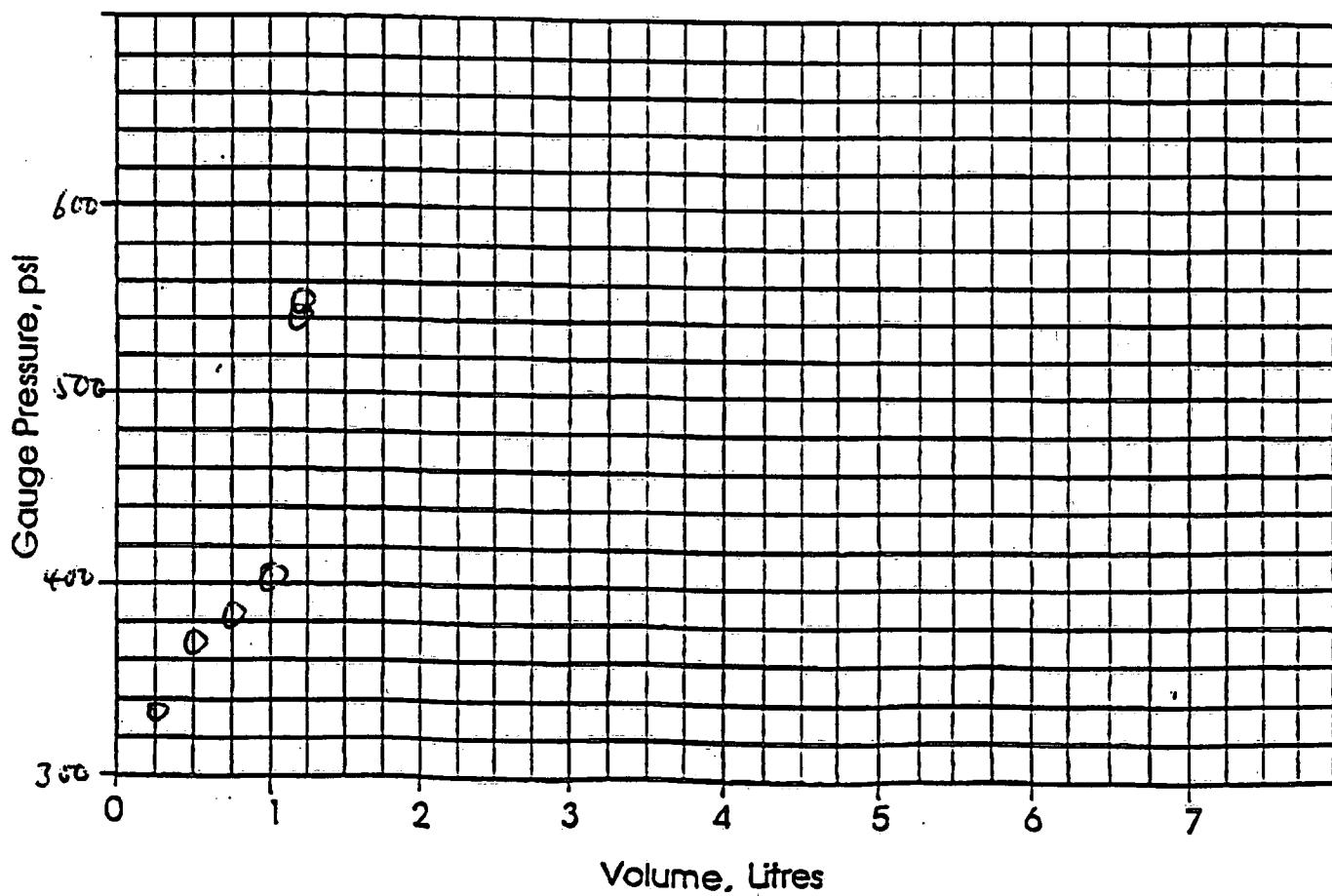
MP Packer Inflation Record

Project: _____ Job number: _____
Location: _____ Completed by: _____ JV & CT
Hole No.: BH 64 Date Inflated: May 12/97
Packer No.: 22 Depth(m / ft) _____
Inflation Tool Setting (psi) 380 Depth to Standing Water (m / ft)
- open hole _____

Volume (Litres)	0.25	0.50	0.75	1.00	1.20	1.2	1.2				
Pressure (PSI)	355	370	385	405	540	545	Ø				

inflation volume - 1.20L inflation pressure - 165 PSI

Plot of Gauge Pressure (PSI) vs. Volume (L)



**Appendix E
Installation Logs for Borehole 67**

Summary Casing Installation Log

Well No. 67
Job No.

Client Environment Canada
Site Smithville
Project Description

Well Information

Reference Datum

Elevation of Datum 0.00 m.

Position of MP Casing Top above / below Datum 0.00 m. above datum

Position of MP Casing Bottom Below Datum 55.07 m. below datum

Well Description

Other References

Log Information

Designed By JV & PL

Date May 1/99

Approved By PL

Date May 2/99

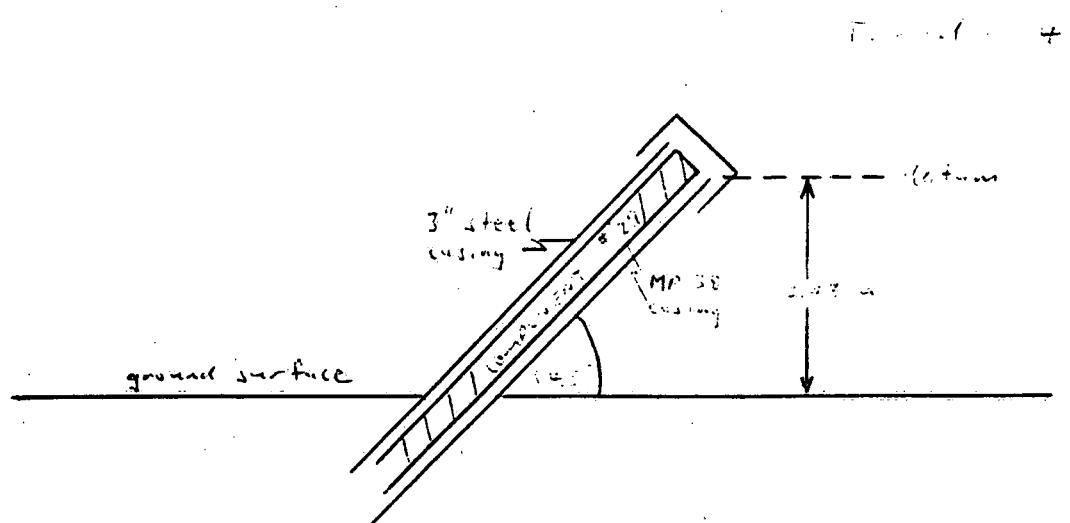
Checked By JV

Date May 10/99

Computer File No. 67

Date Tue May 11 16:44:12 1999

Sketch of Wellhead Completion



Westbay Instruments Inc.

#115-949 W. Third Street, North Vancouver, B.C., Canada V7P-3P7
Phone: [604] 984-4215 / [800] 663-8770 / Fax [604] 984-3538

Report of Well

67

FOR: Environment Canada

DESCRIPTION:

DESIGNED BY: JU S D

WELL INFORMATION:

DEPTH: 56.96 m. TOP OF MP: 0.00 m. ELEVATION: 0.00 m.

WELL USING: Nominal Lengths

COMPONENTS

DESCRIPTION	PART NUMBER	QUANTITY
MP38 CASING 3 METERS	0225M30	011
MP38 CASING 1.5 METERS	0225M15	002
MP38 STANDARD PACKER	0236M15	007
MP38 CASING 1 METER	0225M10	008
MP38 CASING .5 METERS	0225M05	001
MP38 END CAP (metric)	0223	001
MP38 REGULAR COUPLING	0221	013
MP38 MEASUREMENT PORT	0222	008
MP38 PUMPING PORT	0224	008

Well Designer Report
Job No. 1

Date: Thu 11

Date: Thu Aug 20 05:38:12 1999

Page:

Well No.



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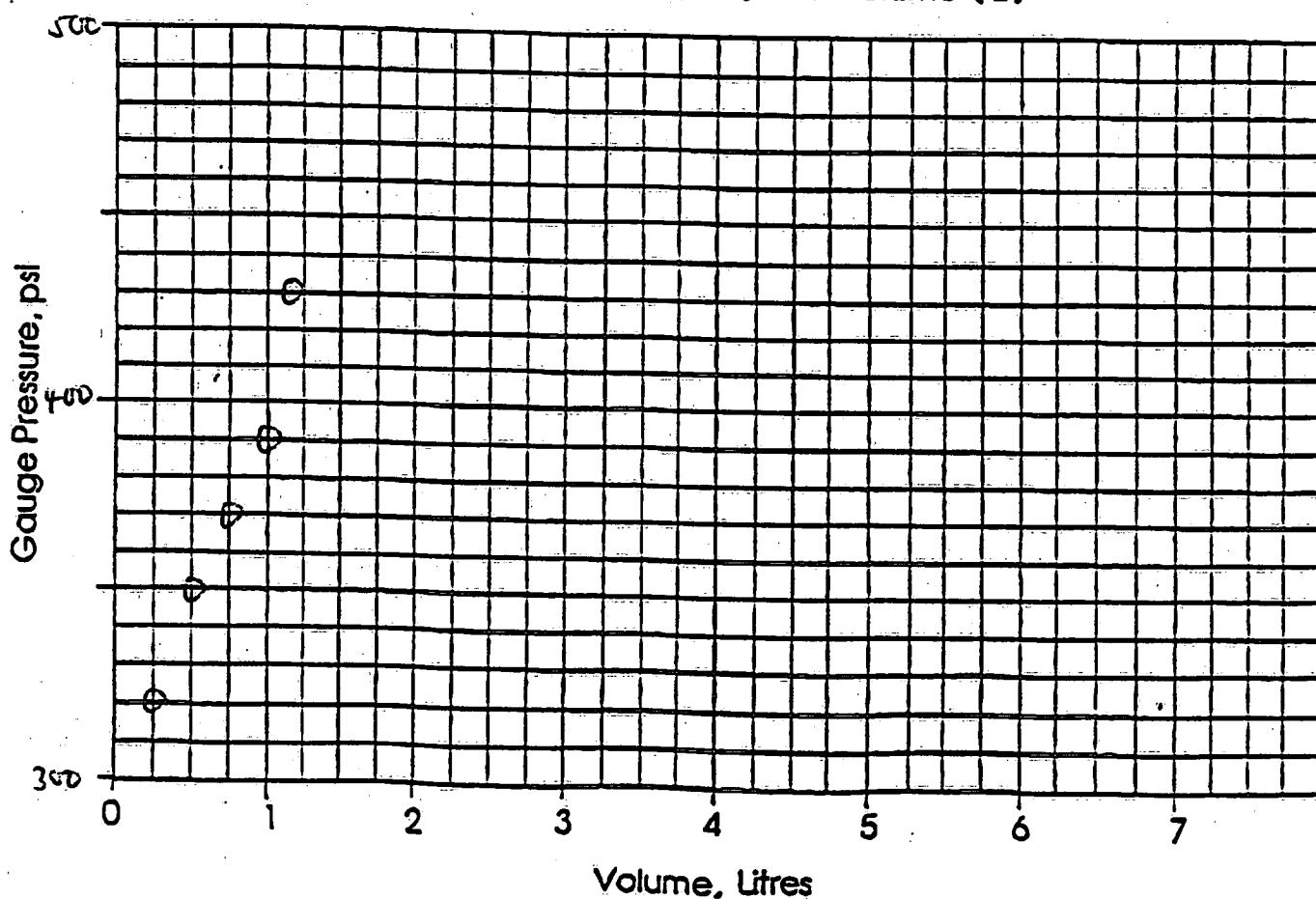
MP Packer Inflation Record

Project: _____ Job number: _____
Location: Smithville Completed by: JV & CT
Hole No.: B14-67 Date Inflated: May 13 / 99
Packer No.: 4 Depth(m / ft) _____
Inflation Tool Setting (psi) 240 PSI Depth to Standing Water (m / ft)
- open hole

Volume (Litres)	0.25	0.50	0.75	1.00	1.2	1.1					
Pressure (PSI)	320	350	370	390	430	∅					

final inflation volume - 1.10 l final inflation pressure - 190 PSI

Plot of Gauge Pressure (PSI) vs. Volume (L)





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MP Packer Inflation Record

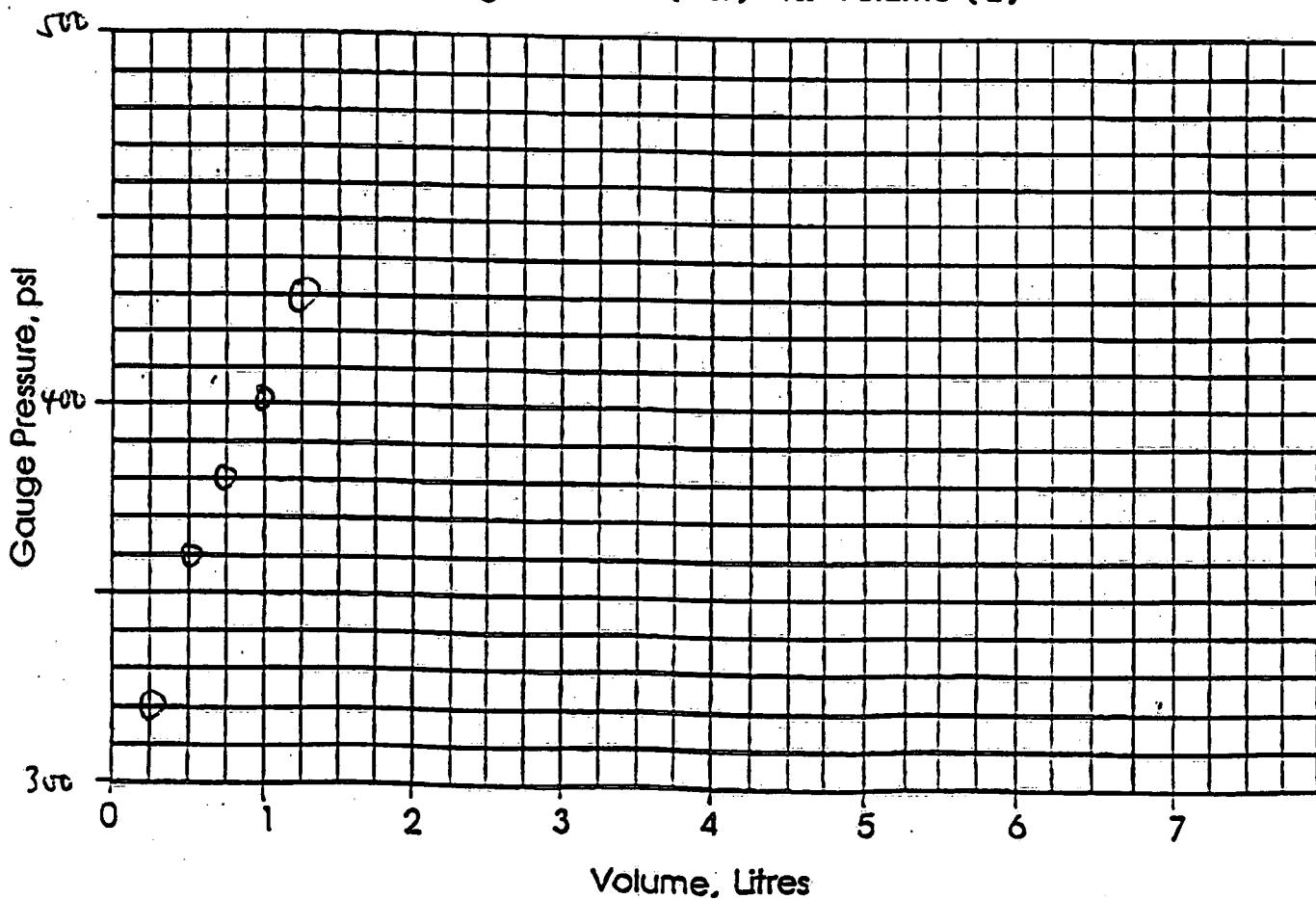
Project: _____ Job number: _____
Location: Smithville Completed by: JV & CT
Hole No.: BH-61 Date Inflated: May 13/99
Packer No.: 7 Depth(m / ft) _____
Inflation Tool Setting (psi) 240 psi Depth to Standing Water (m / ft)
- open hole

Volume (Litres)	0.25	0.50	0.75	1.00	1.25	1.20					
Pressure (PSI)	320	360	380	405	430	48					

inflation volume - 1.20 l

inflation pressure - 190 PSI

Plot of Gauge Pressure (PSI) vs. Volume (L)





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May 14/99

deflation value = 120 PSI

inflation tripping = 360 PSI

" " release = 270 but still dropping slowly.

inflation in tubes with gauge in zone - reading 180 PSI at 400 line pressure !!!

MP Packer

Inflation Record

Page ____ of ____

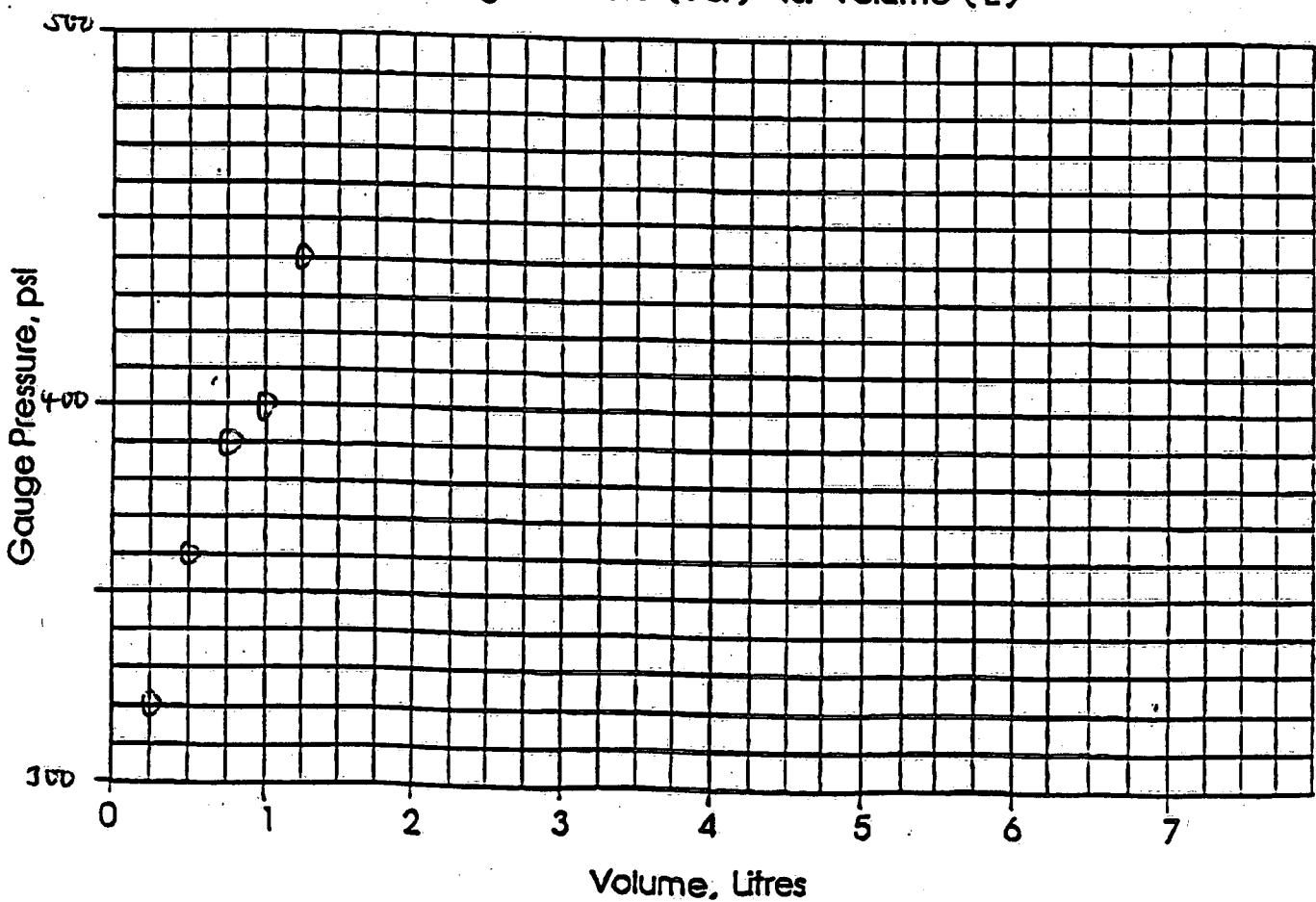
Project: _____ Job number: _____

Location: Smithville Completed by: JV & CTHole No.: BH-67 Date Inflated: May 14/99Packer No.: 9 Depth(m / ft) _____Inflation Tool Setting (psi) 240 Depth to Standing Water (m / ft)
- open hole

Volume (Litres)	0.25	0.50	0.75	1.0	1.25	1.20					
Pressure (PSI)	320	360	390	400	440	∅					

inflation volume - 1.20 l inflation pressure - 200 PSI

Plot of Gauge Pressure (PSI) vs. Volume (L)





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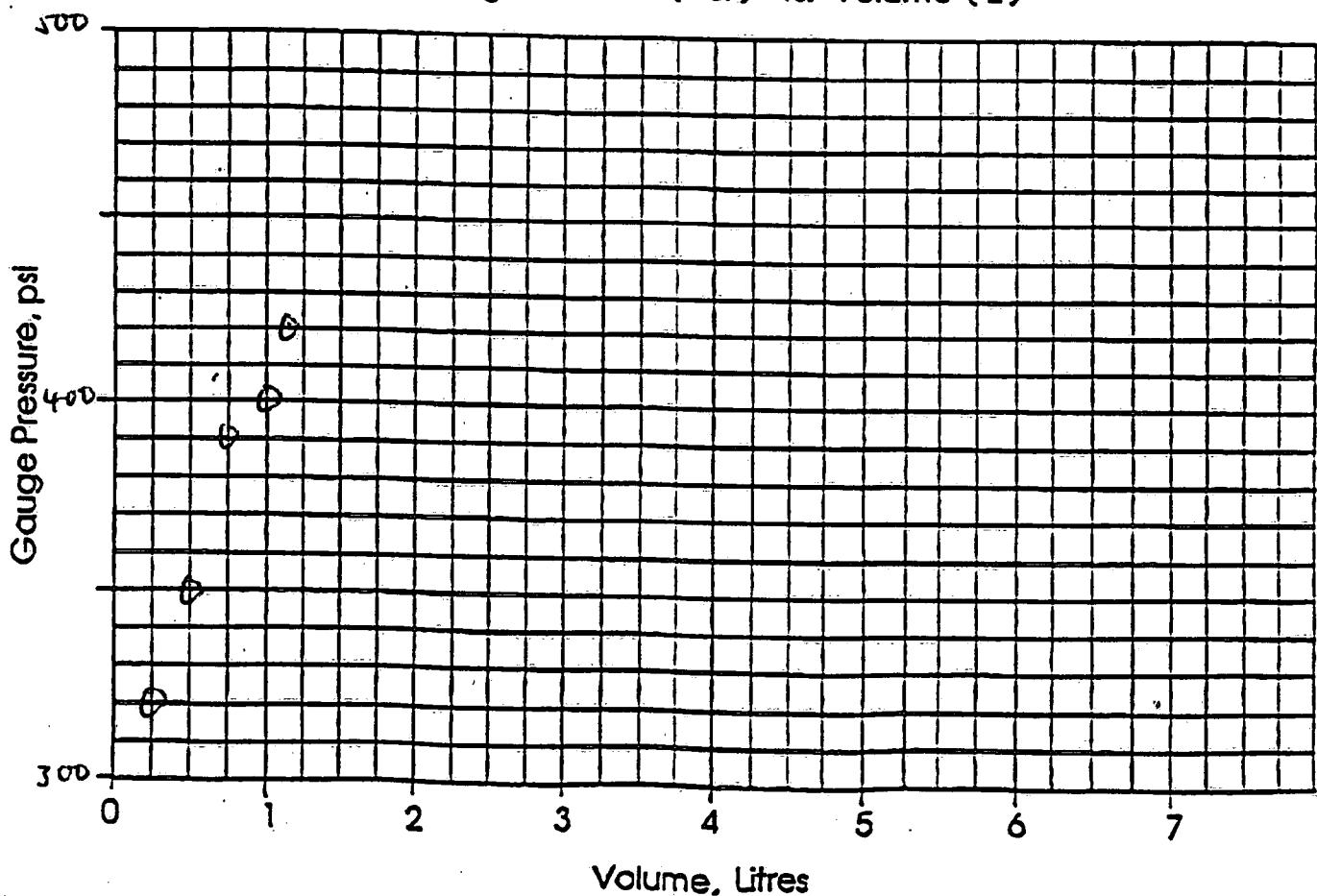
MP Packer Inflation Record

Project: _____ Job number: _____
Location: Sun, Thrville Completed by: JV & CT
Hole No.: BH-67 Date Inflated: May 14/99
Packer No.: 12 Depth(m / ft) _____
Inflation Tool Setting (psi) 260 Depth to Standing Water (m / ft)
- open hole

Volume (Litres)	0.25	0.50	0.75	1.00	1.20	1.15					
Pressure (PSI)	320	350	390	400	420	460					

inflation volume - 1.15 l inflation pressure - 460 PSI

Plot of Gauge Pressure (PSI) vs. Volume (L)





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MP Packer Inflation Record

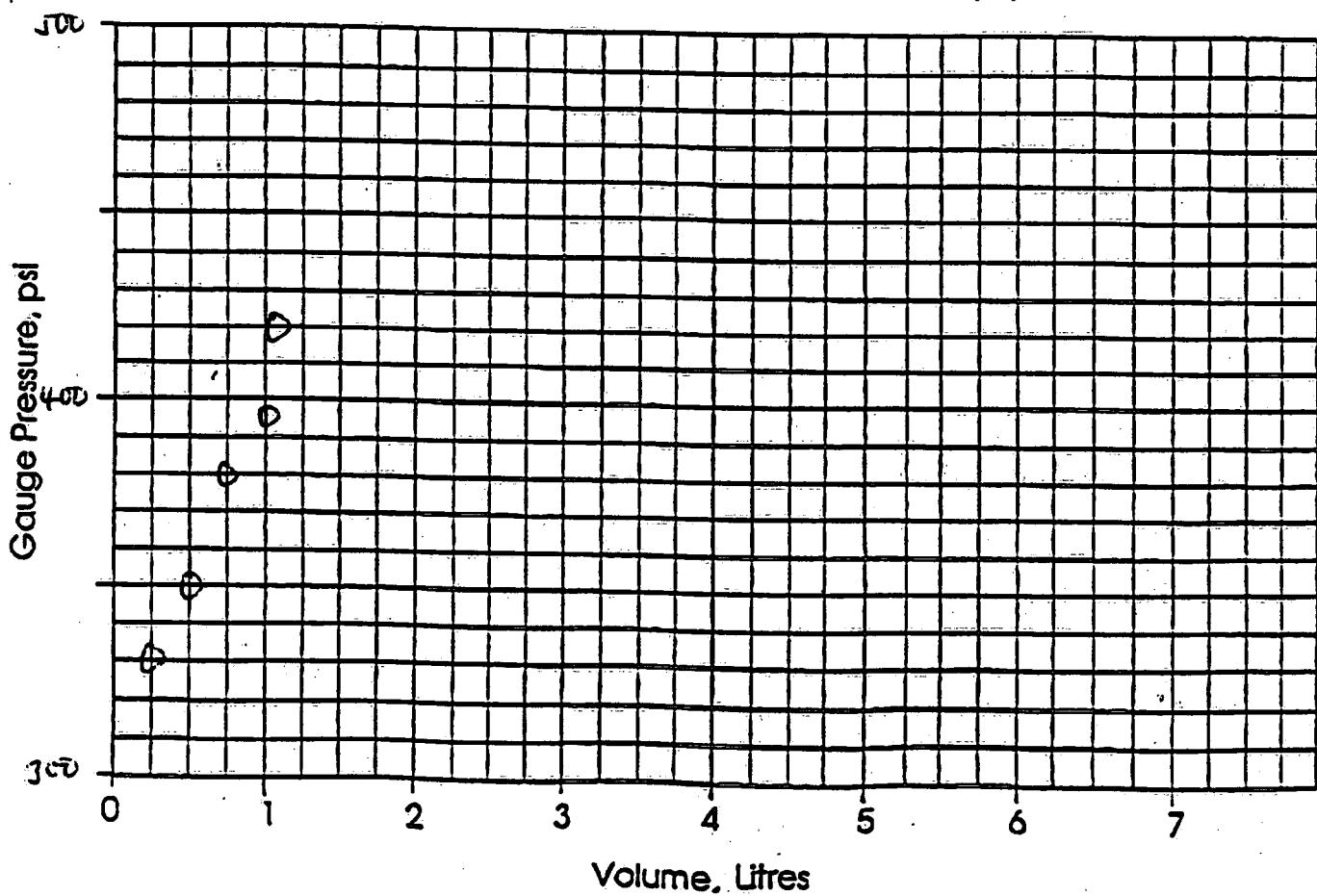
Project: _____ Job number: _____
Location: Sun, Thu, 11e Completed by: JV & CT
Hole No.: BH - 67 Date Inflated: May 14 / 99
Packer No.: 15 Depth(m / ft) _____
Inflation Tool Setting (psi) 240 Depth to Standing Water (m / ft)
- open hole

Volume (Litres)	0.25	0.50	0.75	1.00	1.1	1.0					
Pressure (PSI)	330	350	380	395	420	48					

inflation volume - 1.00 l

inflation pressure - 180 PSI

Plot of Gauge Pressure (PSI) vs. Volume (L)





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MP Packer Inflation Record

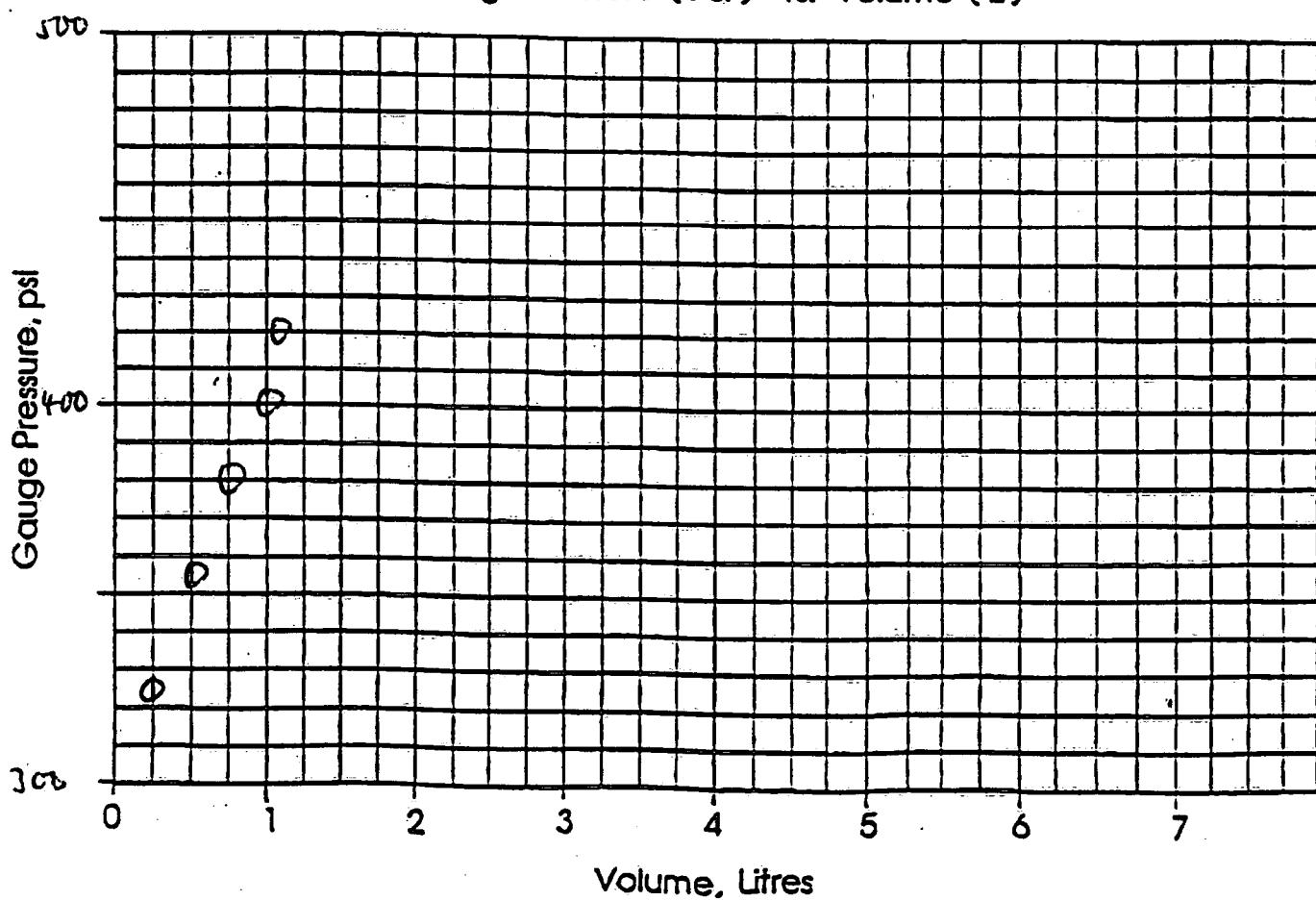
Project: _____ Job number: _____
Location: Smithville Completed by: JV & CT
Hole No.: B4-67 Date Inflated: May 14/99
Packer No.: 20 Depth(m / ft) _____
Inflation Tool Setting (psi) 240 Depth to Standing Water (m / ft) _____
- open hole

Volume (Litres)	0.25	0.50	0.75	1.00	1.25	1.1					
Pressure (PSI)	325	355	380	400	420	∅					

inflation volume - 1.10 l

inflation pressure - 180 PSI

Plot of Gauge Pressure (PSI) vs. Volume (L)





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MP Packer Inflation Record

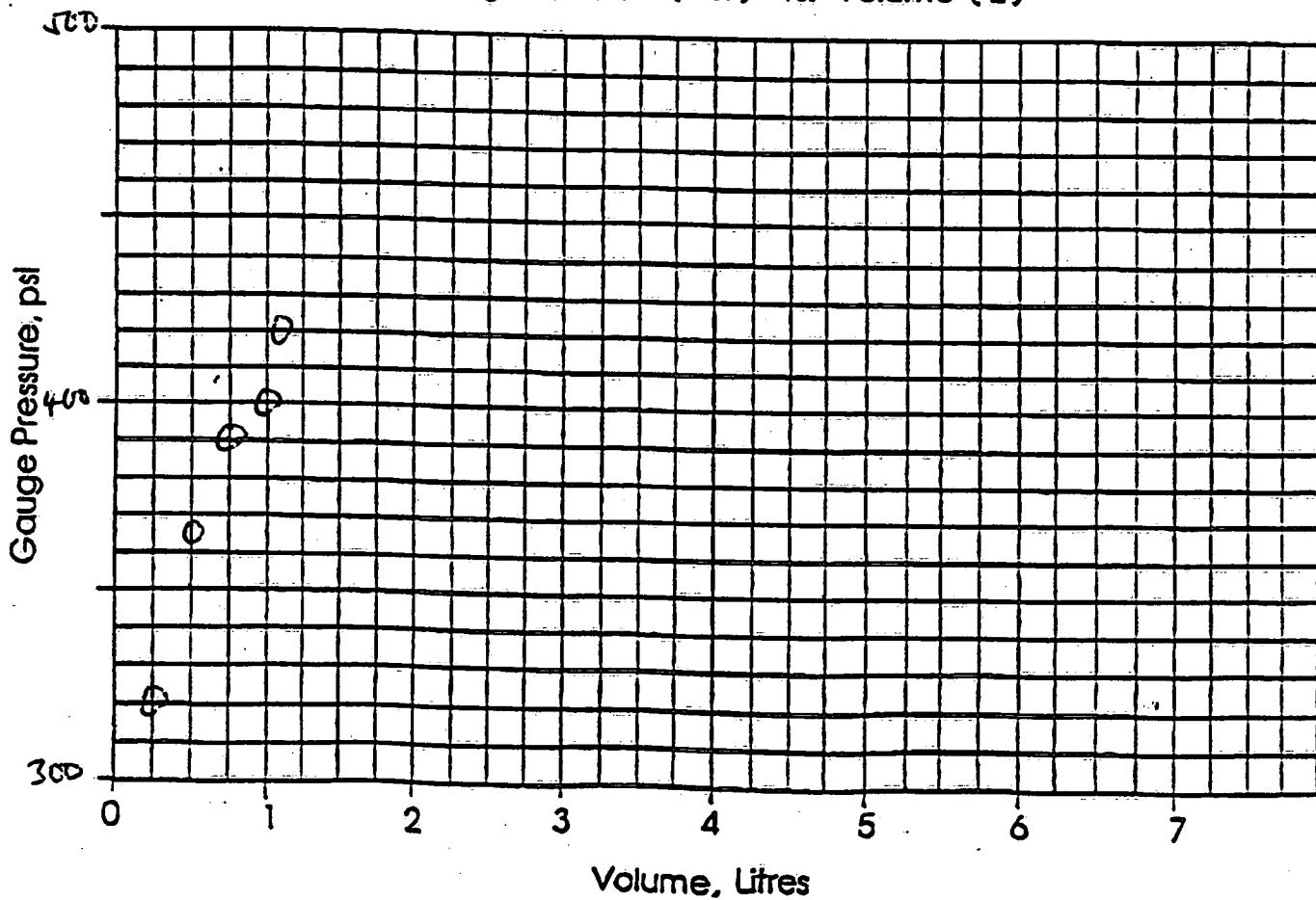
Project: _____ Job number: _____
Location: Sun, Th.ville Completed by: JV & CT
Hole No.: BH-67 Date Inflated: May 14/99
Packer No.: 22 Depth(m / ft) _____
Inflation Tool Setting (psi) 240 Depth to Standing Water (m / ft)
- open hole

Volume (Litres)	0.25	0.50	0.75	1.00	1.1	1.0					
Pressure (PSI)	320	365	390	400	420	460					

inflation volume - 1.00 l

inflation pressure - 180 PSI

Plot of Gauge Pressure (PSI) vs. Volume (L)



Appendix F
Hydraulic head profiles for new boreholes

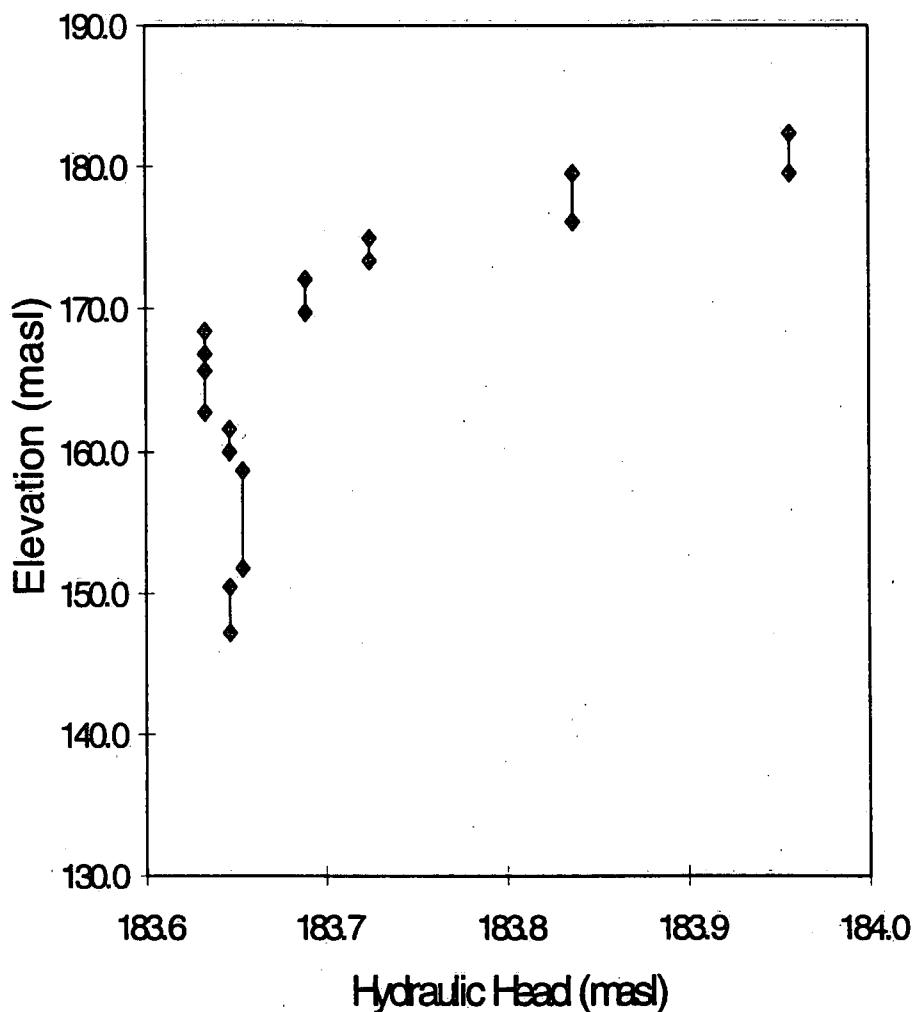
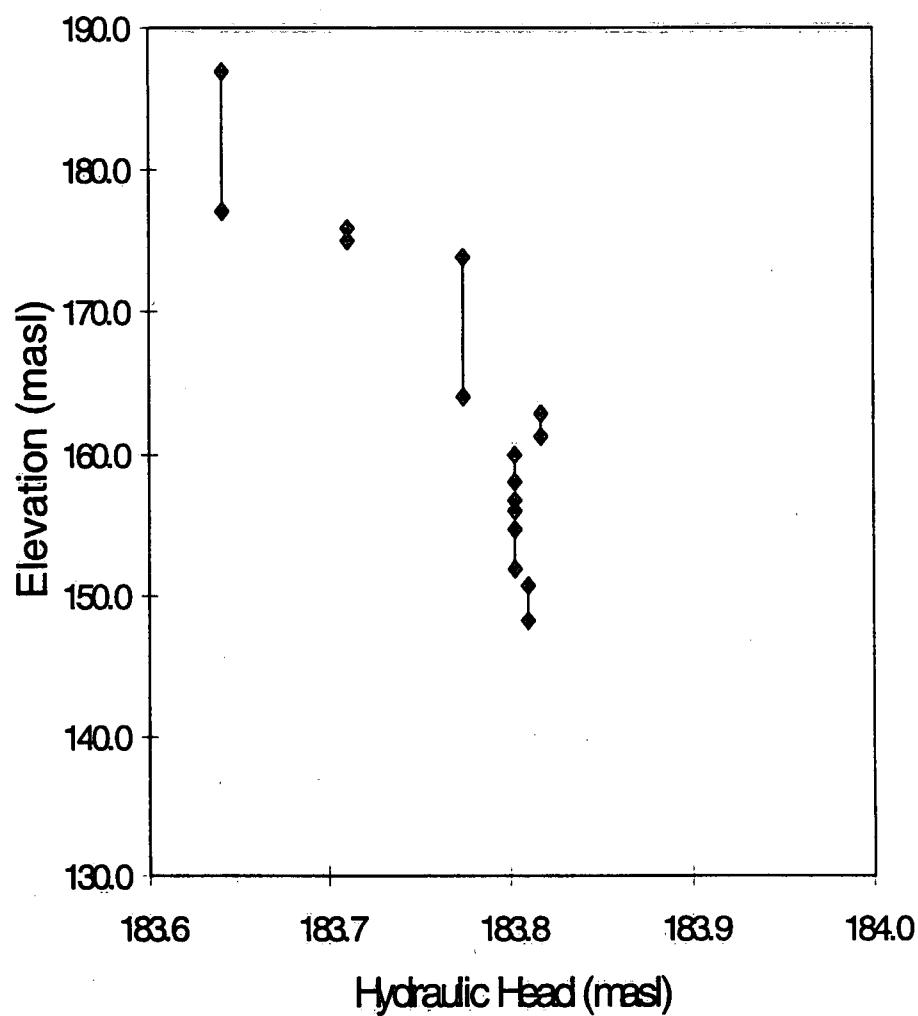


Figure F1. Hydraulic head distribution in borehole 37C measured on July 6, 1999.



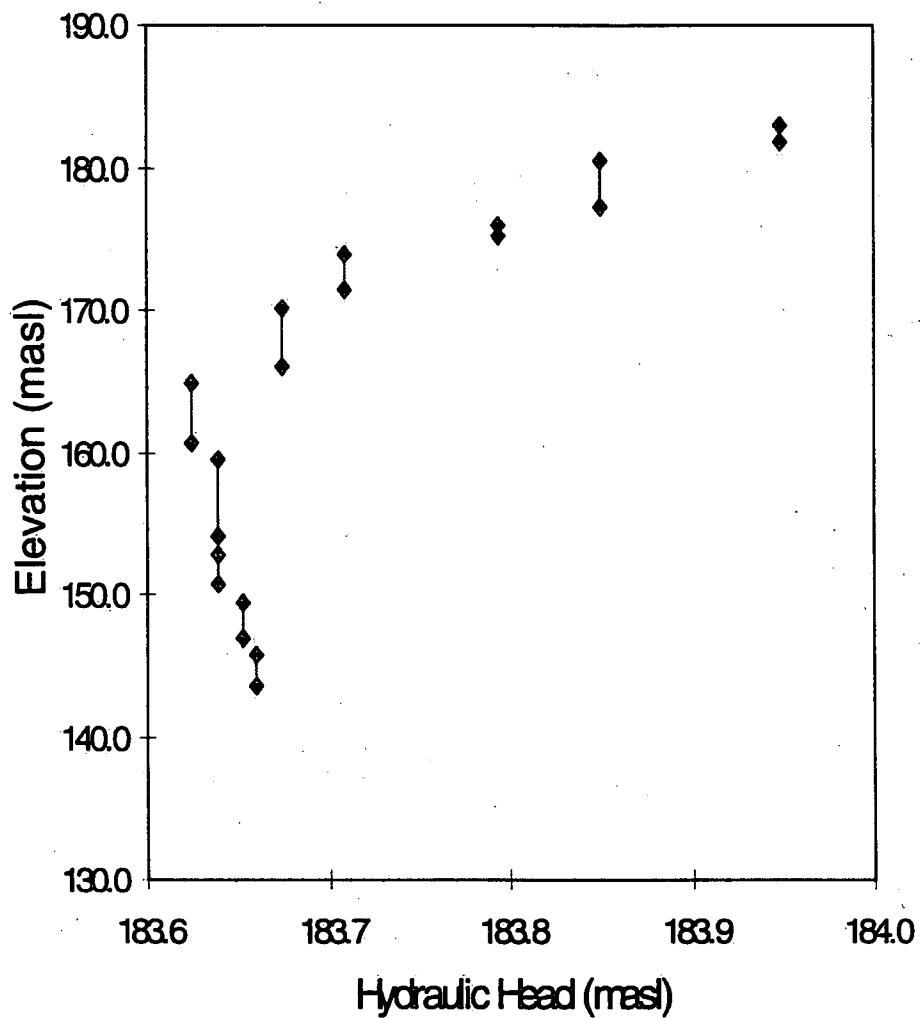


Figure F3. Hydraulic head distribution in borehole 64 measured on July 6, 1999.

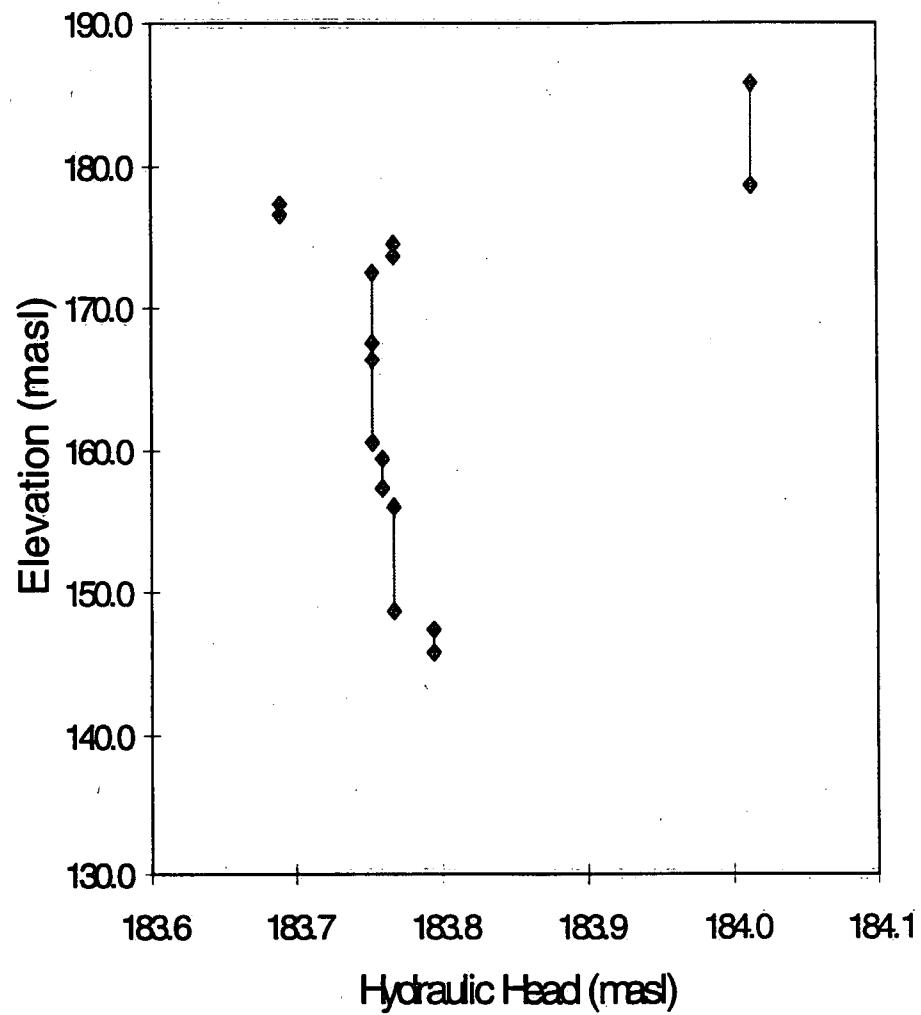


Figure F4. Hydraulic head distribution in borehole 66 measured on July 6, 1999.

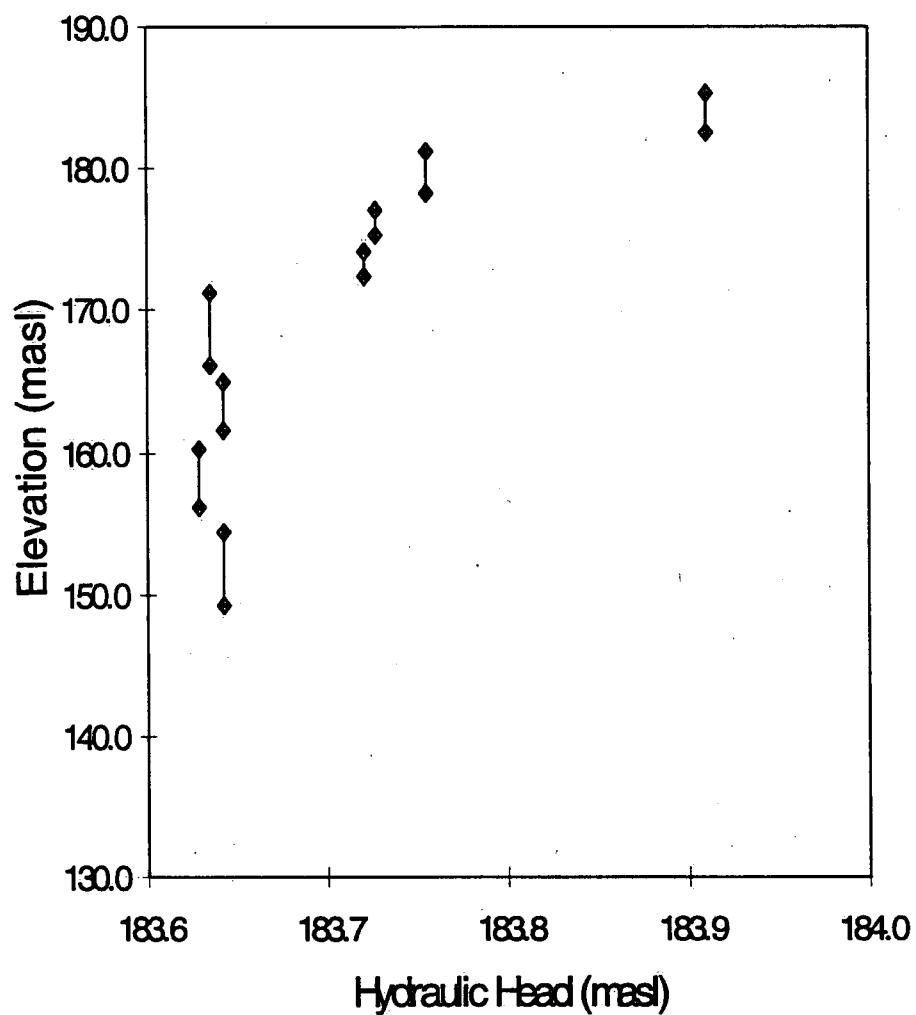
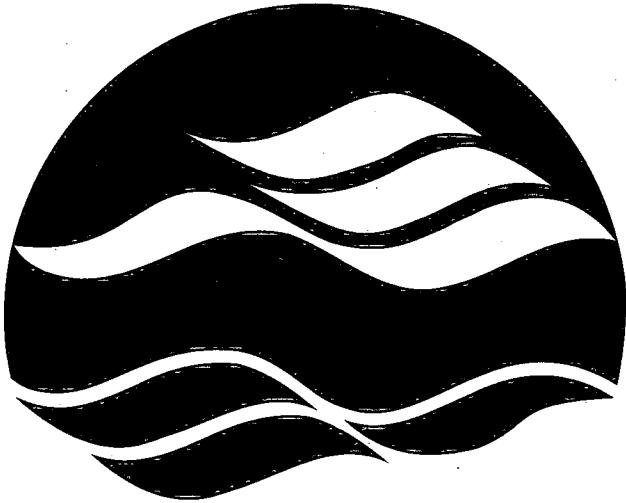


Figure F5. Hydraulic head distribution in borehole 34C measured on July 6, 1999.



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