DRILLING, CONSTRUCTION AND TESTING OF AN OBSERVATION WELL IN THE PINE VALLEY AREA, NORTHEAST OF WILLIAMS LAKE, B.C.

Observation Well No. 289
Contract No. 76

W.S. Hodge
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Water Management Branch

October, 1984

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DRILLING, CONSTRUCTION AND TESTING OF AN OBSERVATION WELL IN THE PINE VALLEY AREA, NORTHEAST OF WILLIAMS LAKE, B.C. OBSERVATION WELL NO. 289, CONTRACT NO. 76

1. INTRODUCTION

One 6-inch diameter (152 mm) observation well was completed to a depth of 95 feet (29.0 metres) on the Pine Valley Road right-of-way, in the Pine Valley area, 6 miles (9.6 kilometres) northeast of Williams Lake (Figure 1 & 2). The well was contructed by Mannville Drilling (B.C.) Co. Ltd. of Williams Lake on March 19-20, 1984, and tested by Hillside Pumps of Williams Lake on March 21, 1984. Total contract costs for well completion and testing were $3,661.75 (Appendix A).

The Pine Valley area was chosen for establishment of an observation well on the recommendations of Regional Water Management staff, (Wei 1983). A field survey was made in December 1983, to locate a suitable abandoned well for use as an observation well. This attempt was unsuccessful and a decision was made to construct a well. The site was selected on the right-of-way of Pine Valley Road, adjacent to the southerly boundary of Lot , Plan 12624, D.L. 8861, Cariboo District. The site is approximately 6 miles northeast of Williams Lake.

Well density along Pine Valley Road is high and residents rely entirely on the local groundwater reserve. It is also anticipated that the Pine Valley area will undergo further development. Water level fluctuations and the long term effects of groundwater extraction will be monitored using an automatic water level recorder installed on the well. The information obtained will assist in future water services and land use planning in this area. The recorder is equipped with a protective steel housing and is intended to remain in place for a minimum period of 10 years.

2. WELL CONSTRUCTION AND TESTING

The 6-inch (152 mm) well was initially drilled to a depth of 100 feet (30.5 metres) using an air rotary drill rig. A 10-inch (254 mm) diameter hole was drilled and cased to 16 feet (4.9 metres). A 6-inch diameter hole was drilled and cased from 16 feet to 100 feet (30.5 metres). Drilling encountered clay and rock (till?) to 75 feet (22.9 metres) and sand and gravel from 75 feet to 100 feet (Figure 3). Clay was encountered at 100 feet (30.5 metres). The sand and gravel is a confined aquifer and exists under artesian conditions. The hole was backfilled to 95 feet (28.9 metres) and the well was completed with a pre-ordered screen assembly consisting of a 4 foot (1.2 metre) length of 18 slot Johnson stainless steel screen with bail bottom and 3.5 feet (1.1 metre) of riser pipe and neoprene packer. Although the material sieved was quite coarse (up to 180 slot) (Appendix A), the 18 slot screen was considered adequate for observation well purposes. The 6-inch (152 mm) casing was then pulled back to expose the screen. The annular space between the 10 inch (254 mm) and 6 inch diameter casing was then grouted and the 10-inch casing was removed.

The well was developed by air for one hour and was visably sand free in less than one hour. A pumping test was conducted March 21, 1984, for 8 hours at a constant rate of 25 USgpm (1.6 L/s). A 3-hp jacuzzi submersible pump was used and set at a depth of 70 feet. The static water level at the time of testing was 22.96 feet (6.7 m) below top of casing. Test data is shown in Appendix A. A drawdown of 0.77 feet (0.24 m) occurred over the test period representing 1.5 percent of the total available drawdown of 52 feet. On the basis of these figures and for a pumping rate of 25 USgpm (1.6 L/s) a specific capacity of 32.5 USgpm/ft (6.7 L/s/m) of drawdown can be calculated. A transmissivity of 4.6×10^4 USgpd/ft (6.6×10^{-3} m^2/s) was calculated from the time drawdown curve while a

transmissivity of 3.1×10^4 USgpd/ft (4.4×10^{-3} m^2/s) was calculated from the time-recovery curve as shown in Appendix A.

Water level recovery was fairly rapid. Ninety minutes after the pump was shut down the water level recovered to 0.21 feet (0.07 m) from the original static water level representing 73 percent recovery. On March 22, 1984 at 8:00 am, approximately 11 1/2 hours after the pump was shutdown, a water level reading of 23.15 feet (7.05 metres) was obtained indicating recovery was 0.15 feet (.04 m) from the original static level. This slight difference may be attributed, however, to normal water level fluctuation in the well. At this point, the automatic water level recorder and housing were installed on the well head.

3. GENERAL GEOLOGY

Regional geology (Figure 4) of the Williams Lake area has been mapped by Tipper (1959). According to Tipper the glacial history in the Williams Lake area is complex and involved at least two periods of glaciation. Each period of glacial advance appears to have occured in a westerly direction towards the Fraser River.

The Pine Valley area is principally underlain by a thin cover of glacial drift and recent alluvium material of mainly till, sand and gravel and silt overlying bedrock. Well depths within the immediate study area are generally less than 100 feet with the majority of wells completed in sand and gravel. Depths to bedrock may vary considerably, however, the two well records encountering bedrock recorded bedrock at 100 and 135 feet (30.5 metres and 41.1 metres).

4. WELL RECORD DATA

The Groundwater Section has records of 25 wells constructed in the Pine Valley subdivision. As shown in Table 1 well depths range from 23 feet (7.0 metres) to 135 feet (41.1 metres). Reported well yields range from 1.7 gpm (.11 L/s) to 50 gpm (3.2 L/s) and the principal aquifer material is described as sand and gravel. The majority of wells on record in this area were drilled during the 1970's by Mannville Drilling (B.C.) Co. Ltd. In December 1983 a preliminary door to door survey was conducted to update data for this area and to attempt to locate a suitable abandoned well for long term monitoring. This survey indicated that many more wells exist in the area than have been shown in Figure 2. For example, every lot on the south side of Pine Valley Road has a well. Our records show wells on 4 lots only. It is estimated that the 25 wells on file represent only about one-third of the actual wells in the Pine Valley area. Numerous wells have been drilled in this area during the last 10 years. It is also apparent that ten to fifteen years ago most wells in the area were reported flowing. At present there are only a few flowing wells reported at lower elevations to the west. Some of these wells are reported to flow year round. In some instances 2 or 3 residences are supplied from one well.

The water level recorder hydrograph obtained to date shows detailed response to local pumping. As more data becomes available however, a more complete synopsis of water level fluctuation can be made.

5. WATER QUALITY

A water sample was collected midway through the pump test and submitted to the Environment Laboratory in Vancouver for chemical analysis. A copy of the analysis is shown in Appendix B. Results indicate the groundwater is moderately mineralized (specific conductance 1000 υmhos/cm) and slightly alkaline (pH 8.3). This analysis compares with the Hach analyses

taken during pumping. Field analyses indicated a specific conductance of 830 umhos/cm, pH of 8.5 and hardness of 598 mg/L. Water quality is typical of the laboratory analysis for the Williams Lake area. The quality of this water is very similar to the quality of observation well #261 on Dog Creek Road. It is intended to sample the Pine Valley observation well once a year during the course of water level monitoring.

6. CONCLUSIONS AND RECOMMENDATIONS

- A 6-inch diameter 95 foot deep observation well has been completed in a confined sand and gravel aquifer existing under artesian conditions.

- This aquifer appears to have potential for supporting a high capacity well or wells. The pump test data has indicated a production well within this aquifer could theoretically sustain a yield of several hundred gallons per minute.

- A further long term pump test of a minimum duration of 24 hours is necessary, however, before any definite or final conclusions can be made regarding the capabilities or characteristics of this aquifer. Long term pumping could reveal hydraulic boundaries not evident from short duration tests. Long term high rate pumping tests are not within the scope of the observation well establishment program under which the well was constructed.

- The recorder hydrograph indicates that water levels in the well are subject to pumping interference from neighboring wells. As more water level data becomes available it will be possible to more fully understand the short and long term recharge and withdrawal effects on this aquifer.

- Water quality is acceptable and meets the standards set by the Canadian Drinking Water Quality Guidelines for all parameters tested. The water is slightly alkaline with a pH value of 8.3 and moderately mineralized (specific conductance 1000 mhos/cm). Water quality is typical for the Williams Lake area. Water quality is very similar to the quality evident in observation well #261 on Dog Creek Road.

- This well should be sampled for complete chemical analysis on an annual basis during the late summer when water levels are historically at their lowest and demand is greatest.

- It is anticipated that this well will be monitored for a minimum period of 10 years.

7. REFERENCES

Callan, D.M. 1968. Notes on Surficial Geology of the Williams Lake Area, File 0239014-B. Water Investigations Branch, B.C. Water Resources Services.

Tipper, H.W. 1959. Geological Survey of Canada, GSC Bulletin 196, Ottawa.

Wei, M. 1983. Memorandum re Groundwater Observation Well Network Expansion Program Proposal, 1983-84 Fiscal Year.

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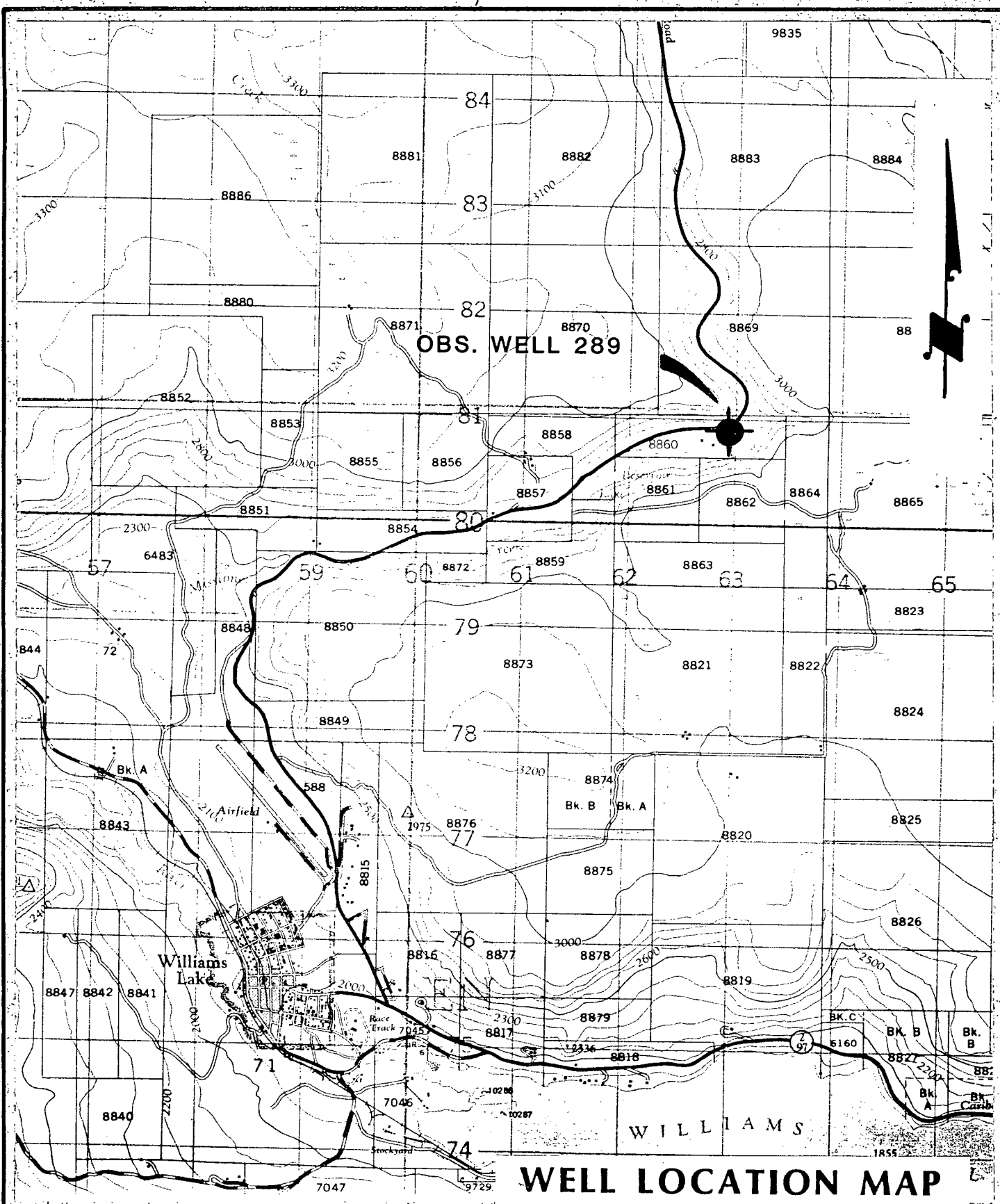


WELL LOCATION MAP

Province of British Columbia
Ministry of Environment
WATER MANAGEMENT BRANCH

TO ACCOMPANY REPORT ON
Drilling Construction and Testing of One Groundwater Observation Well in the Pine Valley Area, Northeast of Williams Lake, B.C.

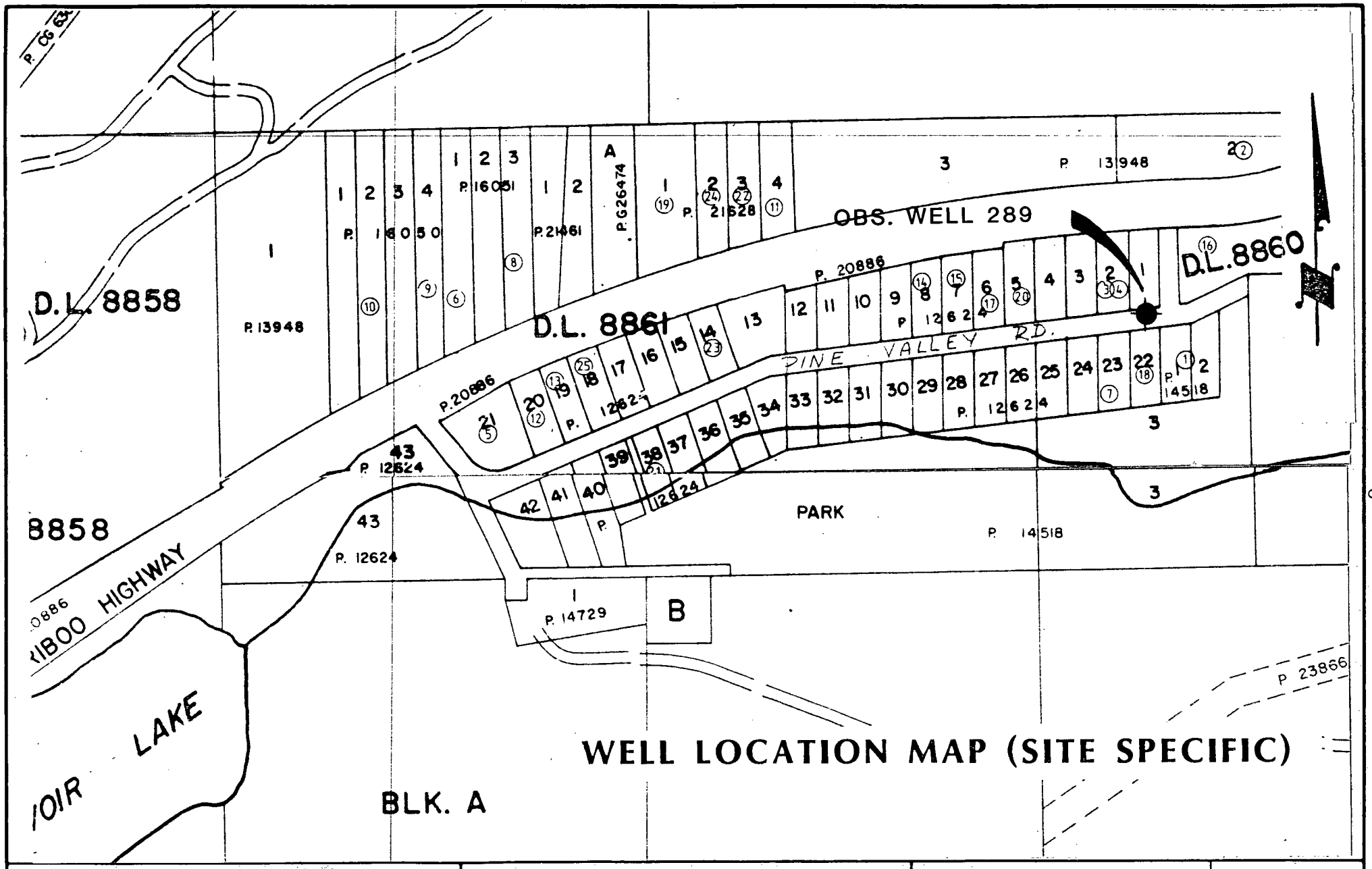
SCALE: VERT. 1" = 1¼ miles
HOR.

DATE: May 1984

M. Wei ENGINEER

FILE No. 93 B/1 DWG. No. Figure 1

BCIL 7673-M.E.



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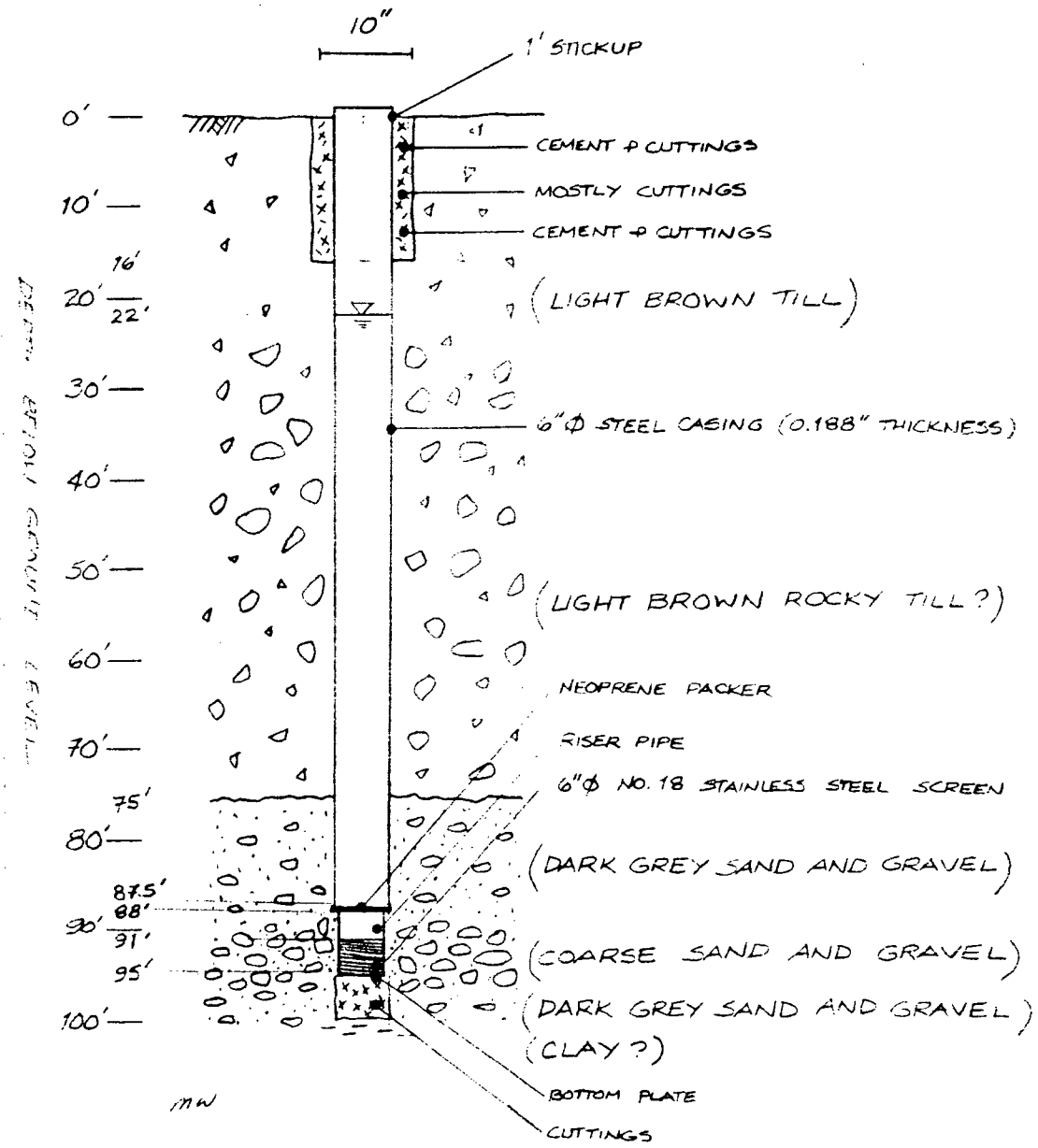
SCALE: VERT 1" = 400 ft.
HOR
DATE May 1984
M. Wei ENGINEER
FILE No. 93 B/1 DWG. No. Figure 2

VANCAL — 7189



WELL CONSTRUCTION DETAILS

AND LITHOLOGY

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INVENTORY AND ENGINEERING BRANCH

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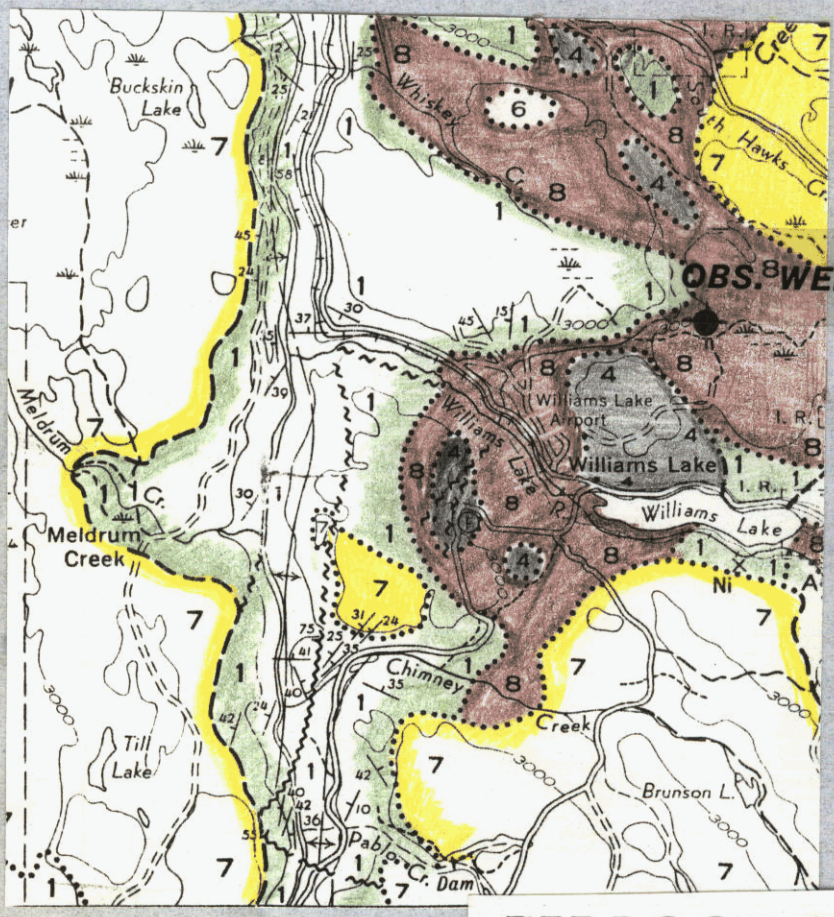
SCALE: VERT. 1" = 20'
HOR. 1"=20" (horiz. exag. 20 X)

DATE May 1984

M. Wei ENGINEER

FILE No. 93 B/1 DWG. No. Figure 3

BCIL 7290 WRS



BEDROCK GEOLOGY

LEGEND

1 — CHERT ARGILLITE LIMESTONE GREENSTONE AND CONGLOMERATE

4 — RHYOLITE ANDESITE DACITE TRACHYITE RELATED TUFF AND BRECCIA BASALT MINOR SEDIMENTS

7 — BASALT ANDESITE RELATED TUFF AND BRECCIA MINOR CONGLOMERATE GREYWACKE SHALE AND DIATOMITE

8 — TILL GRAVEL SAND CLAY AND SILT

(from Tipper, 1959)

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Drilling Construction and Testing of One Groundwater Observation Well in the Pine Valley Area, Northeast of Williams Lake, B.C

SCALE: VERT. [redacted]
HOR. 1" = 4 miles

DATE
May 1984

M. Wei — ENGINEER

FILE No. 93 B/1

DWG. No. Figure 4

BCIL 7673-M.E.

Table 1. Tabulation of Well Record Information in the Pine Valley Area

LOCATION SEC.	LOCATION R.	LOCATION NO.	OWNER'S NAME	DEPTH DUG	DEPTH DRILLED	DISTANCE TO WATER	G.P.M.	WATER USE	WELL ENDS IN	DATE COMPL.	REMARKS
		1		26'		14' → 22' (26')		Domestic	Sand & Hardpan	1962	Hard
		2			86'	52'	5		Sand	4/6/73	
		3			60'	Fl.			Gravel	11/65	Subtill Aq. ✓
		4			70'	Art.		Domestic	Gravel	1964	Subtill Aq./ Hard/8.5/459
		5		23'		15' 21' July		Domestic	Till	1964	Hard
		6			85'	38'	5		Sand & Gravel	8/4/71	Subtill Aq. ✓
		7			80'	Gl.	20		Gravel	6/5/70	Subtill (?) Aq.
		8			85'	41'	10		Clay & Gravel	11/9/70	Subtill (?) Aq.
		9			67'	24'	1.67		Sand & Gravel	18/10/67	Subtill (?) Aq.
		10			52'	33'	1.83		Gravel	2/10/67	Subtill (?) Aq.
		11			65'	31'	6.67		Gravel	16/8/69	Subtill (?) Aq.
		12			75'	Fl.	10		Gravel	8/2/70	Subtill Aq. ✓
		13			82'	Fl.	10		Gravel	28/12/70	Subtill Aq. ✓
		14			85'	Fl.	50		Sand & Gravel	6/72	Subtill Aq. ✓
		15			81'	Fl.	15		Sand & Gravel	26/7/71	Subtill Aq. ✓
		16			90'	25'	10		Clay & Gravel	4/73	Subtill (?) Aq.
		17			90'	Fl.	25		Clay & Gravel	4/72	Subtill (?) Aq.
		18			100'	16'	15		Gravel	22/7/74	Subtill Aq. ✓
		19			89'	38'	4		Gravel, Rk, & Some Cl.	18/4/74	

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SCALE: VERT. N/A HOR. N/A
DATE May 1984
M. Wei ENGINEER
FILE No. 93 B/1 DWG. No. Table 1

VANCAL — 7189

Table 1. Tabulation of Well Record Information in the Pine Valley Area

LOCATION			OWNER'S NAME	DEPTH		DISTANCE TO WATER	G.P.M.	WATER USE	WELL ENDS IN	DATE COMPL.	REMARKS
SEC.	R.	NO.		DUG	DRILLED						
		20			90'	Gl.	20		Gravel	23/9/74	Subtill Aq. ✓
		21			45'	Fl.	35		Gravel	16/4/74	Subtill (?) Aq.
		22			135'	50'	10		Bdrk.	25/7/75	
		23			100'	3'	10		Bdrk.	23/4/75	Subtill Aq. ✓
		24			126'	50'	10		Rock Cl.	24/7/75	
		25			60'	0.3'	20	Domestic	Gravel	11/8/78	Subtill Aq. ✓

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INVENTORY AND ENGINEERING BRANCH

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SCALE: VERT N/A
HOR N/A
DATE May 1984
M. Wei ENGINEER
FILE No. DWG. No.

VANCAL — 7189

APPENDIX A

Well Record, Pump Test Data, Contract Costs,
Grain Size Analyses Results

93B.020.4.3.1. 26

OBS. WELL #289

WATER WELL RECORD

DEPT. OF ENVIRONMENT, WATER RESOURCES SERVICE, WATER INVESTIGATIONS BRANCH — VICTORIA, BRITISH COLUMBIA

Z ___ WELL NO. ___ E ___ N ___ (Z X Y NO.)

Legal description: Lot 1 (Adj. to R/W of #653) Sec. ___ Tp. ___ R. ___ D.L. 8861 Land District CARIBOO Plan 12624

Descriptive location: PINE VALLEY ROAD, ADJACENT TO LOT 1 — Licence No. ___ Date ___

Nat. Topo. Sheet No. 93 B/1

Owner's name: MINISTRY OF ENVIRONMENT — Address: 765 BROUGHTON, VICTORIA B.C.

Driller's name: MANNVILLE — Address: WILLIAMS LAKE, B.C. — Date completed: MAR. 1984

Depth: 98 — Elevation of ___ ☐ Estimated ☐ Surveyed — Casing diam. ___ Length ___

Method of construction: AIR ROTARY — Casing diam. 6" — Length 94'

Screen location: 94-98 — Screen ■ — Size 20 SLOT — Length 4' — Type JOHNSON S.S

Sanitary seal: Yes ☐ No ☐ — Screen ☐ Size ___ Length ___ Type ___

Perforated casing ☐ Length ___ Perforations from ___ to ___

Gravel pack ☐ Length ___ Diam. ___ Size gravel, etc. ___

Distance to water: 29' ☐ Estimated — Water level

From: TOP CASING ■ Measured — Elevation ___ Artesian pressure ___

Date of water level measurement: MAR. 20 — Water use: OBSERVATION WELL

PRODUCTION TEST SUMMARY

Date: Mar. 21, 1984

Test by: HILLSIDE PUMPS

Bail test ☐ Pump test ■ — Duration of test: 8 hrs

Rate: 25 USgpm — Drawdown: .77'

Water level at completion of test: 23.74'

Available drawdown: 47' — Specific capacity ___

Permeability ___ — Storage coeff. ___

Transmissivity: 4.6 x 10⁴ USgpd/ft

Recommended pumping rate: –

Recommended pump setting: –

CHEMISTRY

Test by: ENVIRONMENTAL LAB - VANCOUVER, B.C. — Date: Mar. 22 1984

Total dissolved solids ___ mg/l — Temperature ___ °C — pH ___ — Silica (SiO_2) ___ mg/l

Conductance ___ µmhos/cm at 25°C — Total iron (Fe) ___ mg/l — Total hardness ($CaCO_3$) ___ mg/l

Total alkalinity ($CaCO_3$) ___ mg/l — Phen. alkalinity ($CaCO_3$) ___ mg/l — Manganese (Mn) ___ mg/l

Colour ___ Odour ___ Turbidity ___

Anions	mg/l	epm
Carbonate (CO_3)		
Bicarbonate (HCO_3)		
Sulphate (SO_4)		
Chloride (Cl)		
$NO_2 + NO_3$ (Nitrogen)		
* TKN. (Nitrogen)		
Phosphorus (P)		

Cations	mg/l	epm
Calcium (Ca)		
Magnesium (Mg)		
Sodium (Na)		
Potassium (K)		
Iron (dissolved)		

* TKN = Total Kjeldahl Nitrogen — Chemistry site no. 1401954

NO_2 = Nitrite NO_3 = Nitrate

CHEMISTRY FIELD TESTS

Test by: D. Kalyn — Date: Mar 22, 1984 — Equipment used: HACH KIT

COND 830 µmhos/cm — PH. 8.5 — chl. < 50 mg/L

Temp 7°C — Fe. < .5 mg/L — Hd. 600 mg/L

LITHOLOGY

From	To	Description
0	75	CLAY AND ROCKS
75	98	GRAVEL
98	100	BLUE CLAY

CONTENTS OF FOLDER

■ Drill log ☐ Pump test data ☐ Chemical analysis

☐ Sieve analysis ☐ Geophysical logs ☐ Report

Other: Refer to NTS file 93 B/1 #35 for complete information re. this well.

Sources of information ___

Appendix A

14

WELL RECORD

(reduced to 75% OF ORIGINAL)

Province of British Columbia
Ministry of Environment
WATER MANAGEMENT BRANCH

To accompany report on: Drilling Construction and Testing of One Groundwater Observation Well in the Pine Valley Area, Northeast of Williams Lake, B.C.

Scale: Vert. -- Hor. --

Date: May 1984

M. Wei, Engineer

File No. 93 B/1 — Dwg. No. Appendix A

BCIL 7673-M-E

"CONSTANT RATE" PUMPING TEST DATA FROM WELL NO. 289

Date MARCH 21, 1984

Time	Time (t) since start of pumping in mins.	Depth to water in well from top of casing in ~~feet~~ m	Drawdown in well in ~~feet~~ (static = 6.999m)	Height of water in tube on orifice pipe in inches	U.S.gals. per min. discharge from well	WATER LEVELS MEAS. BY M. WEI
9:11am	0	(~ ± 0.005) 6.999	(± 0.005) 0			
	0.5	7.113	0.114			
	1	7.116	0.117			
	1.5	7.118	0.119			
	2	7.124	0.125			
	2.5	7.127	0.128			
	3	7.129	0.130			
	3.5	7.131	0.132			
	4	7.136	0.137			
	4.5	7.137	0.138			
	5	7.139	0.140			
	6	7.140	0.141			
	7	7.143	0.144			
	8	7.146	0.147			
	9	7.148	0.149			
	10	7.149	0.150		24.7 USgpm	MEAS. BY D.K.
	12	7.151	0.152			
	14	7.156	0.157			
	16	7.159	0.160			
	18	7.162	0.163			
	20	7.162	0.163			
	25	7.170	0.171			cond = 830 μmhos/cm @ 27 min T° = 7°C BY D.K.
9:41am	30	7.172	0.173			
	35	7.177	0.178			
	40	7.180	0.181			
	45	7.182	0.183			
	50	7.186	0.187		27.5 USgpm @ 58 min	MEAS. BY D.K.
10:11am	60	7.186	0.187			
	70	7.187	0.188			
	80	7.188	0.189			
	90	7.189	0.190			
	100	7.190	0.191		LAB SAMPLE TAKEN @ 120 min	cond = 830 μmhos/cm @ 120 min T° = 7°C BY D.K.
	150	7.198	0.199		24.4 USgpm @ 165 min	Hach on disch PH = 8.5 Fe < 0.5 mg/l phenol alk = 0 methyl orange alk = 32 grains chl < 50 mg/l, Hard = 35 grains
	200	7.208	0.209			
	250	7.204	0.205		24.4 USgpm @ 220 min	

"CONSTANT RATE" PUMPING TEST DATA FROM WELL NO. 289

Date MARCH 21, 1984

Time	Time (t) since start of pumping in mins.	Depth to water in well from top of casing in ~~feet~~ m	Drawdown in well in ~~feet~~ (static = 6.999)	Height of water in tube on orifice pipe in inches	U.S.gals. per min. discharge from well
	300	7.213	0.214		
	350	7.220	0.221		
	400	7.223	0.224		24.4 US gpm @ 390 min
	450	7.228	0.229		
5:11 pm	480	7.235 mw	0.236 mw		24.4 US gpm @ 465 min mw

RECOVERY READINGS IN WELL NO. 289 AFTER "CONSTANT RATE" PUMPING TEST

Date MARCH 21, 1984

MEAS. BY M. WEI

Time	Time (t) since start of pumping in mins.	Time (t') since Pumping stopped in mins.	Value of t / t'	Depth to water in well from top of casing in ~~feet~~ m	Residual drawdown in well in ~~feet~~ m (static = 6.999)
5:11pm	480	0	∞	7.235	0.236
	480.5	0.5	961	7.122	0.123
	481	1	481	7.115	0.116
	481.5	1.5	321	7.111	0.112
	482	2	241	7.104	0.105
	482.5	2.5	193	7.103	0.104
	483	3	161	7.109	0.110
	483.5	3.5	138.1	7.110	0.111
	484	4	121	7.107	0.108
	484.5	4.5	107.7	7.106	0.107
	485	5	97	7.104	0.105
	486	6	81	7.100	0.101
	487	7	69.6	7.098	0.099
	488	8	61	7.094	0.095
	489	9	54.3	7.091	0.092
	490	10	49	7.088	0.089
	492	12	41	7.083	0.084
	494	14	35.3	7.080	0.081
	496	16	31	7.078	0.079
	498	18	27.7	7.076	0.077
	500	20	25	7.077	0.078
	505	25	20.2	7.077	0.078
	510	30	17	7.070	0.071
	515	35	14.7	7.069	0.070
	520	40	13	7.063	0.064
	525	45	11.7	7.067	0.068
	530	50	10.6	7.068	0.069
6:11pm	540	60	9	7.069	0.070
	550	70	7.9	—	—
	560	80	7	7.072	0.073
6:41pm	570	90	6.3	7.064	0.065
			mw	mw	mw

MACKAY WELL

RECOVERY READINGS ON OBSERVATION WELL NO. ___ AFTER CONSTAINT RATE PUMPING TEST ON WELL NO. 289

Date MARCH 21, 1984

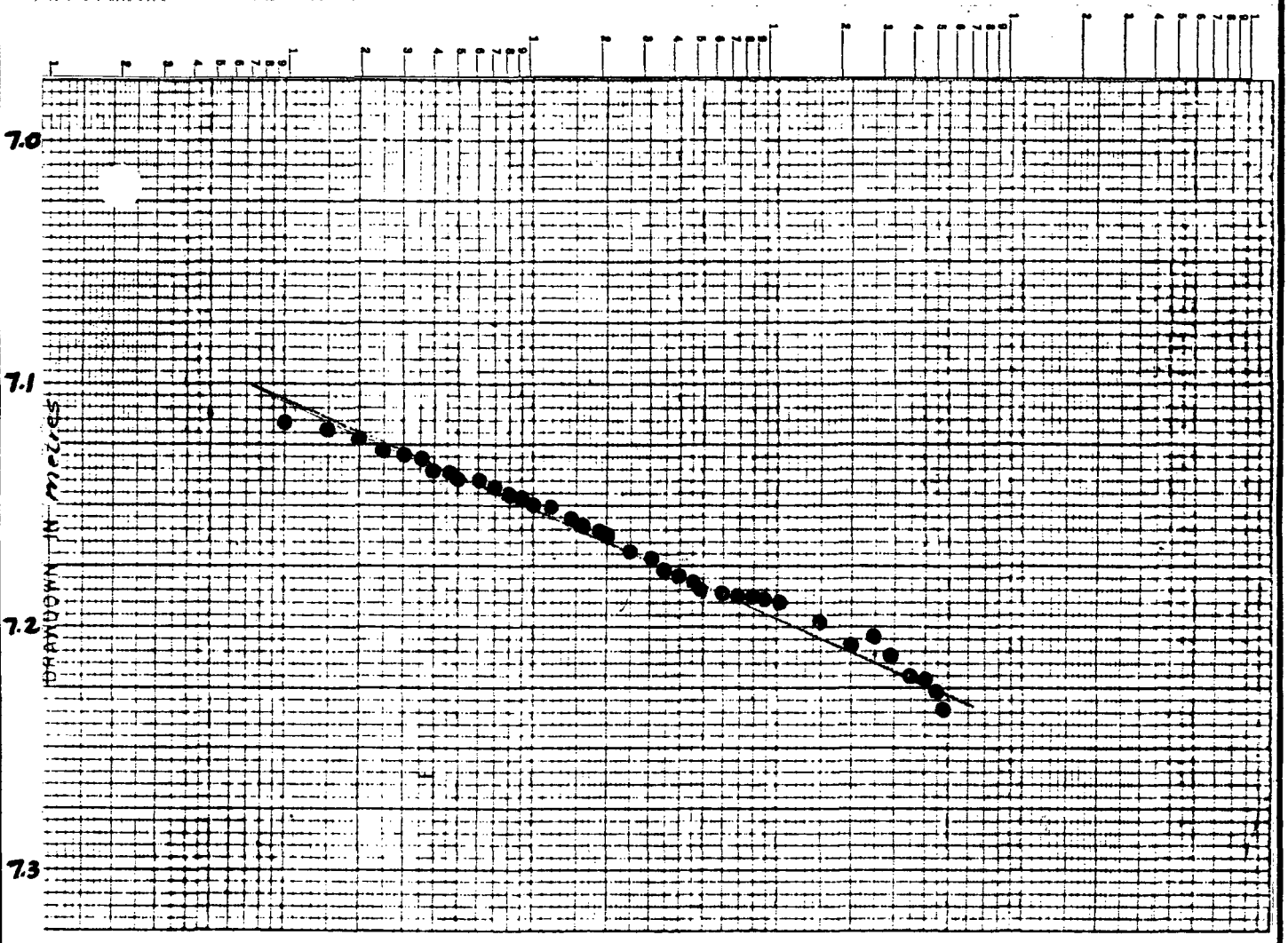
MEAS. BY D. KALYN

Time	Time (t) since pumping started in mins.	Time (t') since pumping stopped in mins.	Value of t / t'	Depth to water in well from top of casing in ~~feet~~ m	Residual drawdown in well in ~~feet~~ (static = 2.655)
5:11 pm	480	0	∞	2.802	0.147
	480.5	0.5	961	2.802	0.147
	481	1	481	—	—
	481.5	1.5	321	2.787	0.132
	482	2	241	2.783	0.128
	483	3	161	2.778	0.123
	484	4	121	2.773	0.118
	485	5	97	2.772	0.117
	486	6	81	2.772	0.117
	487	7	69.6	2.764	0.109
	488	8	61	2.760	0.105
	489	9	54.3	2.759	0.104
	490	10	49	2.755	0.100
	492	12	41	2.752	0.097
	494	14	35.3	2.745	0.090
	496	16	31	2.744	0.089
	498	18	27.7	2.742	0.087
	500	20	25	2.742	0.087
	505	25	20.2	2.741	0.086
	510	30	17	2.737	0.082
	515	35	14.7	2.734	0.079
	520	40	13	2.728	0.073
	525	45	11.7	2.728	0.073
	530	50	10.6	2.730	0.075
6:11 pm	540	60	9	2.732	0.077
	550	70	7.9	2.735	0.080
			mW	mW	mW

READINGS TAKEN ON OBSERVATION WELL NO. ___ DURING MACKAY WEL
"CONSTANT RATE" PUMPING TEST

Date MARCH 21, 1984

Time	Time (t) since start of pumping in mins.	Depth to water in well from top of casing in feet m	Drawdown in well in feet m (static = 2.655)	MEAS. BY D. KALYN
9:11am	0	2.655	0	
	3	2.690	0.035	
	4	2.710	0.055	
	5	2.707	0.052	
	6	2.710	0.055	
	7	2.710	0.055	
	8	2.710	0.055	
	9	2.710	0.055	
	10	2.712	0.057	
	14	2.717	0.062	
	16	2.724	0.069	
	18	2.727	0.072	
	20	2.733	0.078	
	25	2.733	0.078	
	30	2.738	0.083	
	35	2.742	0.087	
	40	2.746	0.091	
	45	2.749	0.094	MACKAY WELL (OBS WELL) PUMP KICKED ON AT 46.5 MIN. FOR A BRIEF MOMENT
	50	2.751	0.096	
10:11am	60	2.752	0.097	
	70	2.753	0.098	
	80	2.753	0.098	
	90	2.753	0.098	
	100	2.755	0.100	
	150	2.758	0.103	
	202	2.777	0.122	MEAS. BY M. WEI
	252	2.776	0.121	
	303	2.780	0.125	
	353	2.783	0.128	
	400	2.790	0.135	
	450	2.793	0.138	
5:11pm	480	2.802	0.147	
		MW	MW	



TIME DRAWDOWN CURVE

DATA FROM WELL No. 289 (PUMPED, OBSERVATION)

$$T = \frac{264 \times Q}{\Delta s} = 4.6(10^4) \text{ USGPD/AQ.FT.}$$

$$S = \frac{0.3\, T\, t_o}{r^2 \times 1.44 \times 10^3} = \_\_\_\_\_$$

DATE: 21/3/84
ISWL: 23.0 Ft. Below Datum
Q: 25 USGPM
Δs: 0.144 Ft./CYCLE
r: _____ FEET
t_o: _____ MINUTES
PUMP SETTING: 70'

PUMPING TEST OF PINE VALLEY AQUIFER

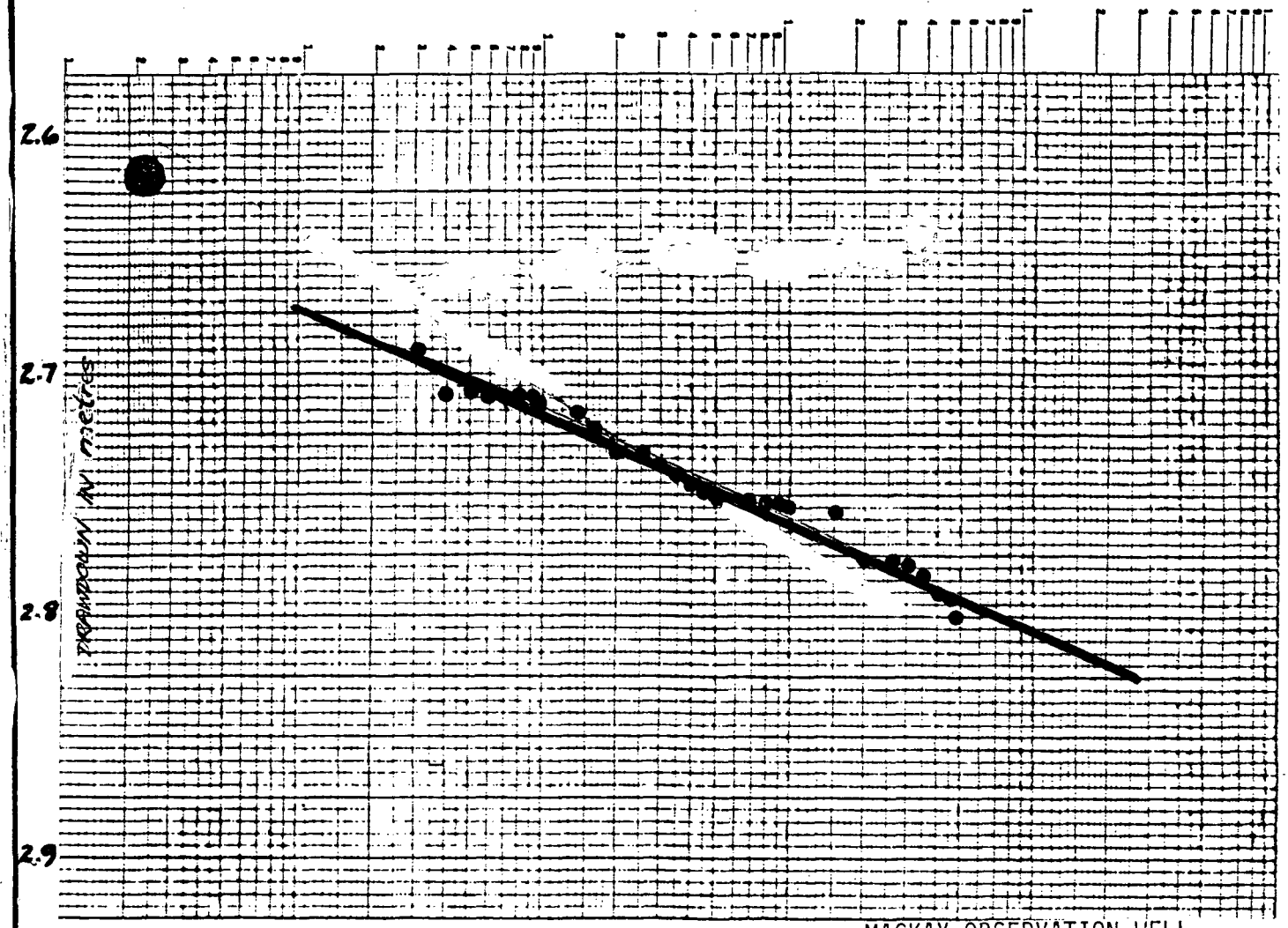
Province of British Columbia
Ministry of Environment
WATER MANAGEMENT BRANCH

TO ACCOMPANY REPORT ON
TIME-DRAWDOWN CURVE OF PUMPING WELL 289

SCALE: VERT. N/A
HOR. N/A
DATE MARCH/84

M. WEI ENGINEER
FILE No. 93 B/1 DWG. No. Appendix A

BCIL 7673-M.E.



TIME DRAWDOWN CURVE

DATA FROM WELL No. _____ (PUMPED, OBSERVATION ✓)

$T = \frac{264 \times Q}{\Delta s} = 3.4(10^6)$ USGPD/AQ.FT.

$S = \frac{0.3 T t_o}{r^2 \times 1.44 \times 10^3} =$ _____

DATE: 21/3/84
ISWL: 8.7 Ft. Below Datum
Q: - USGPM
Δs: .196 Ft./CYCLE
r: 150 FEET
t_o: - MINUTES

PUMPING TEST OF PINE VALLEY AQUIFER

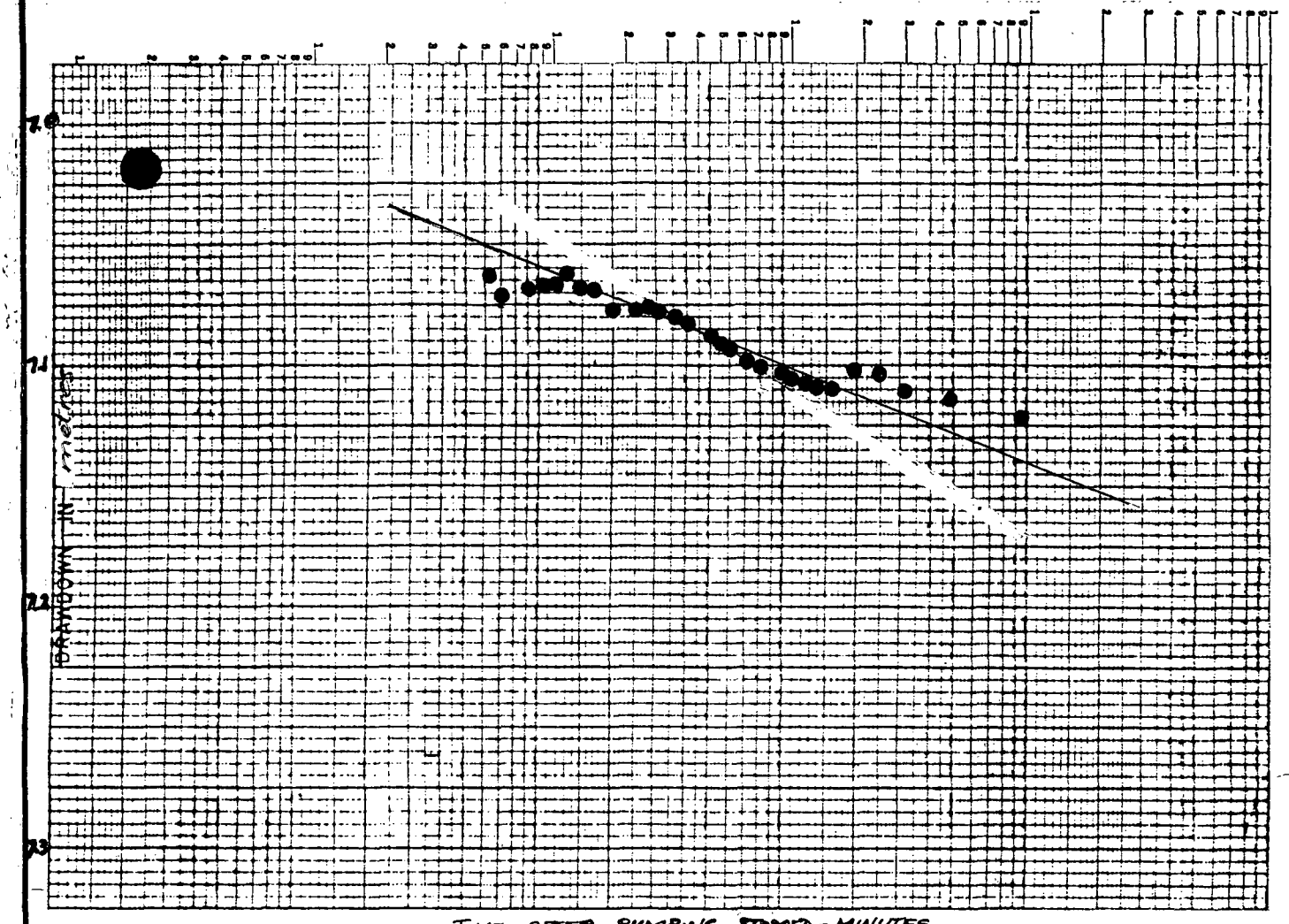
Province of British Columbia
Ministry of Environment
WATER MANAGEMENT BRANCH

TO ACCOMPANY REPORT ON
TIME-DRAWDOWN CURVE OF OBSERVATION (MACKAY) WELL

SCALE: VERT. N/A
HOR. N/A
DATE MARCH/84

M. WEI ENGINEER
FILE No. 93 B/1 DWG. No. Appendix A

BCIL 7673-M.E.



TIME RECOVERY CURVE

DATA FROM WELL No. 289 (PUMPED, OBSERVATION)

$$T = \frac{264 \times Q}{\Delta s} = \frac{3.4(10^4)}{} \text{ USGPD/AQ.FT.}$$

$$S = \frac{0.3\,T\,t_o}{r^2 \times 1.44 \times 10^3} = \_\_\_\_$$

DATE: 21/3/84
ISWL: 23.0 Ft. Below Datum
Q: - USGPM
Δs: .196 Ft./CYCLE
r: _____ FEET
t_o: _____ MINUTES

PUMPING TEST OF PINE VALLEY AQUIFER

Province of British Columbia
Ministry of Environment
WATER MANAGEMENT BRANCH

TO ACCOMPANY REPORT ON
TIME-RECOVERY CURVE OF PUMPING WELL 289

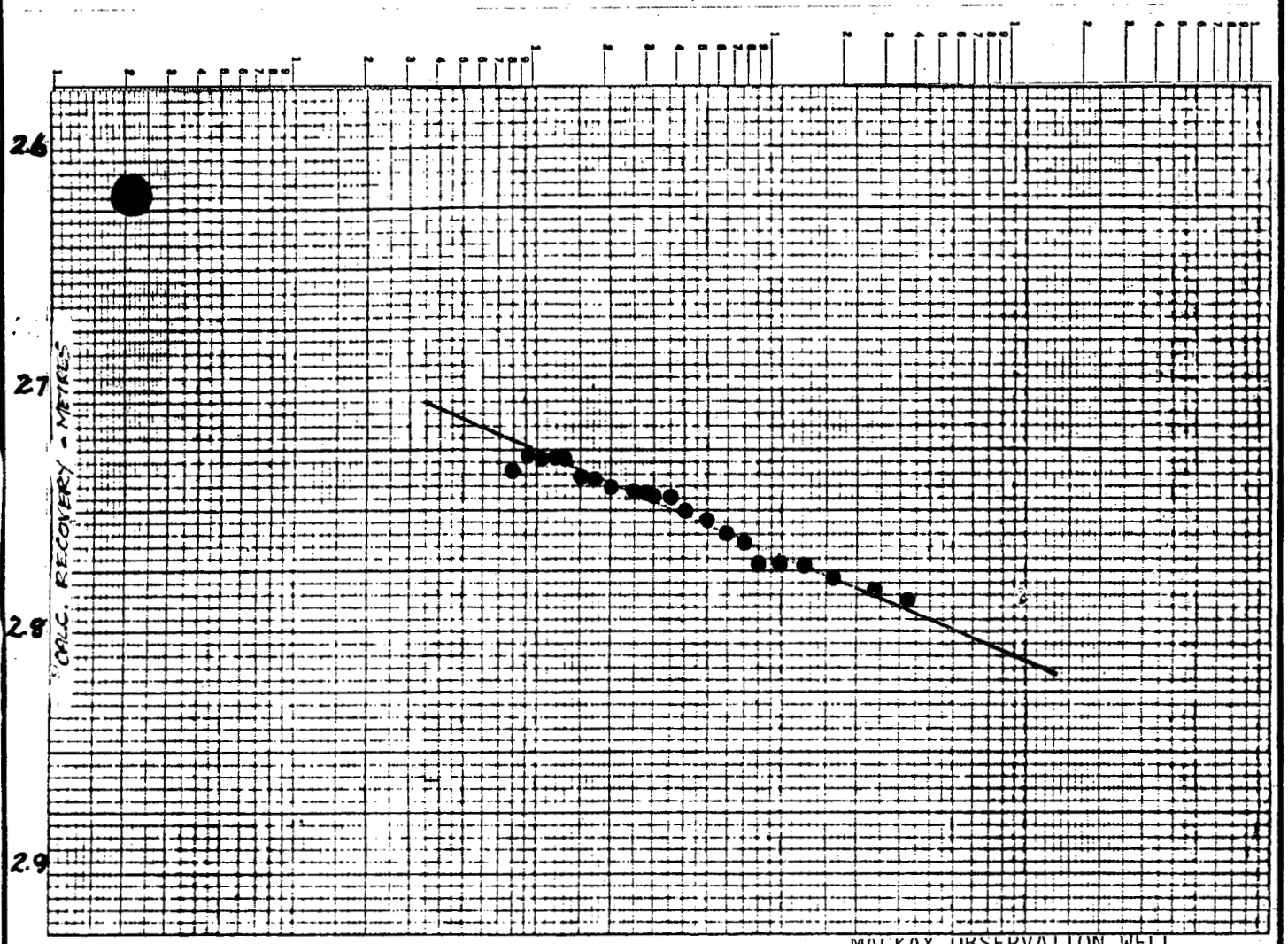
SCALE: VERT. N/A
HOR. N/A

DATE MARCH/84

M. WEI ENGINEER

FILE No. 93 B/1 DWG. No. Appendix A

BCIL 7673-M.E.



TIME RECOVERY CURVE

DATA FROM WELL No. _____ (PUMPED, OBSERVATION ✓)

$$T = \frac{264 \times Q}{\Delta s} = \underline{4.7(10^4)} \text{ USGPD/AQ.FT.}$$

$$S = \frac{0.3 T t_o}{r^2 \times 1.44 \times 10^3} = \underline{< (10^{-5})}$$

DATE: 21/3/84
ISWL: 8.7 Ft. Below Datum
Q: - USGPM
Δs: 0.141 Ft./CYCLE
r: 150 FEET
t_o: < 0.1 MINUTES

PUMPING TEST OF PINE VALLEY AQUIFER

Province of British Columbia
Ministry of Environment
WATER MANAGEMENT BRANCH

TO ACCOMPANY REPORT ON
TIME-RECOVERY CURVE OF OBSERVATION (MACKAY) WELL

SCALE: VERT. N/A
HOR. N/A

DATE MARCH/84

M. WEI ENGINEER

FILE No. 93 B/1 DWG. No. Appendix A

BCIL 7673-M.E.

MANVILLE DRILLING (B.C.) CO. LTD.

R.R. 2, BOX 25, COMMODORE CRESCENT, WILLIAMS LAKE, B.C. V2G 2P2
TELEPHONES: 989-4301 - 392-7562

№ 310

March 22 19 84

IN ACCOUNT W. Ministry of Environment

ADDRESS Parliament Buildings, Victoria, B.C. V8V 1X5

2% Carrying Charge per month on overdue accounts, including interest and payment in arrears.

Pine Valley Observation Well	
16' of 10" cased drilling @ $30.00/ft.	$ 480 00 ✓
17' of 6" overlap casing @ $7.00/ft	119 00 ✓
84' of 6" cased drilling @ $20.00/ft	1,680 00 ✓
1-6" drive shoe	60 00 ✓
screen and fittings	450 00 ✓
screen installation 4' @ $100.00/ft	400 00 ✓
hourly work 1.5 hours developing & grouting	255 00 ✓
install and remove pump	100 00 ✓
hourly rate pump test 8 hrs @ $30.00/hr.	240 00 ✓
hourly rate for recovery 1.5 hr @ $20.00/hr	30 00 ✓
3 sacks cement at cost plus 10%	31 75 ✓
	$ 3845 75 ✓
refund on 10" casing $160.00 refund on 6" casing 24.00	−184 00 ✓
	$ 3661 75 ✓

TERMS:

Upon default of any payment the entire balance becomes due and payable and a Mechanics Lein may be filed.

In the event of non payment of the said total charge, the owner authorizes this company to take whatever legal steps may be deemed necessary to collect and agrees to pay all collection costs.

DRILLER: L R Beckett ACCEPTED BY Mike Wei mw

SIEVE ANALYSIS

PROJECT: Contract 76
LOCATION: Williams Lake, B.C.
WELL NO.: 289
ANALYSIS BY: W.S. Hodge DATE: Sept. 10/84

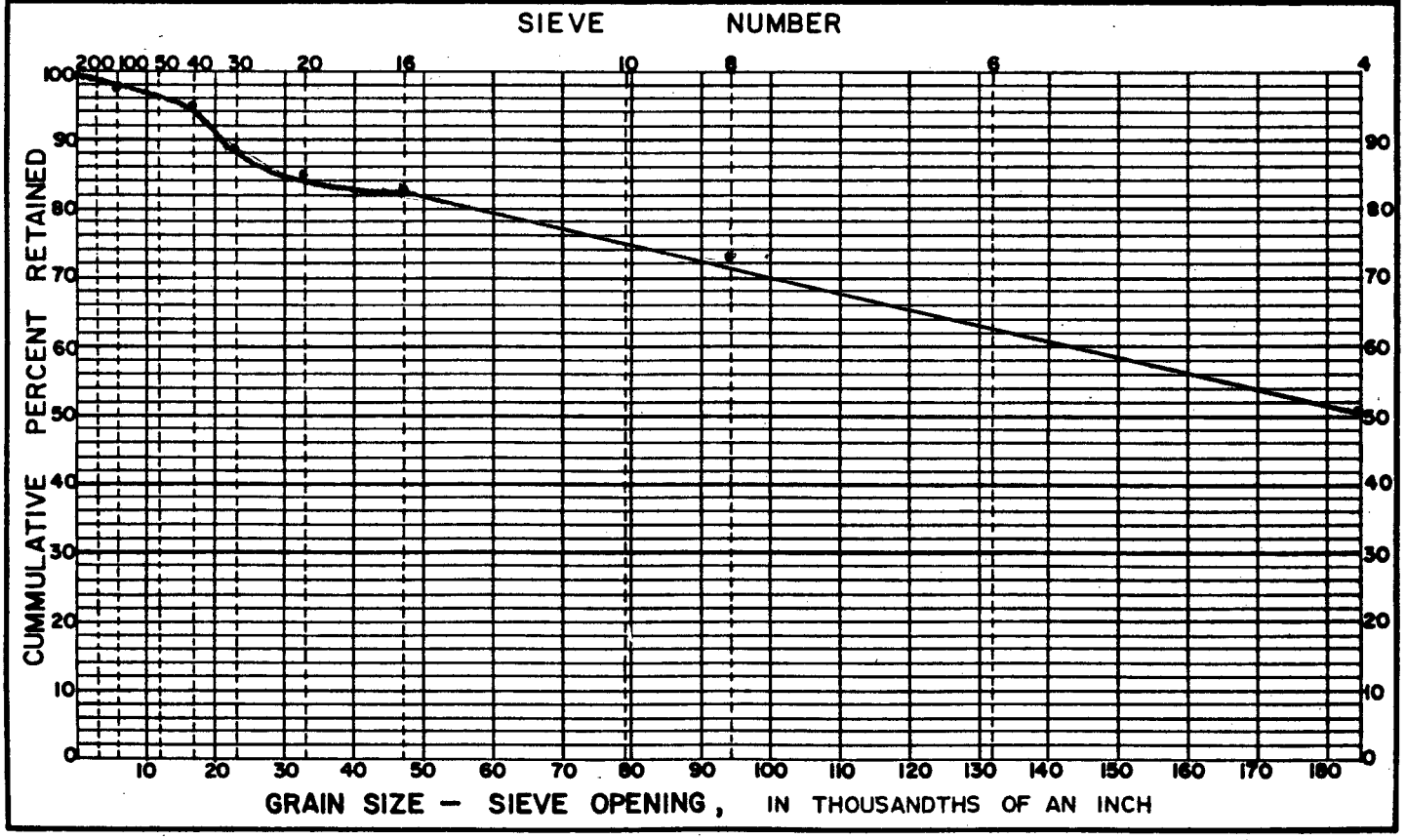
NOTE: The following sieve analysis does not include the 1/2" size and over.

SAMPLE WEIGHT, IN grams	INTERVAL —	INTERVAL —
1. WT. ~~CONTAINER~~ + SAMPLE	651.3	
2. ~~WT. CONTAINER~~	-	
3. WT. SAMPLE less than 1/2" size	581.3	
4. WT. SAMPLE 1/2" size and over	70.0	
5. WT. ENTIRE SAMPLE (i.e 3. + 4.)	651.3	
6. PERCENT SAMPLE 1/2" size and over	11 %	%

DEPTH INTERVAL (FEET)	SCREEN OPENING 90%	50%	40%	30%
74 — 76	21	180+	180+	180+

SIEVE NO.	INTERVAL — CUMM. WT. RET. IN grams	CUMM. % RET.	INTERVAL — CUMM. WT. RET. IN grams	CUMM. % RET.
4	292.0	50.2		
8	422.0	72.6		
16	480.0	82.6		
20	496.2	85.4		
30	513.0	88.2		
40	547.1	94.1		
100	565.1	97.2		
PAN	580.2	99.8		

REMARKS:



SIEVE ANALYSIS

PROJECT: Contract 76
LOCATION: Williams Lake, B.C.
WELL NO.: 289
ANALYSIS BY: W.S. Hodge DATE: Sept. 10/84

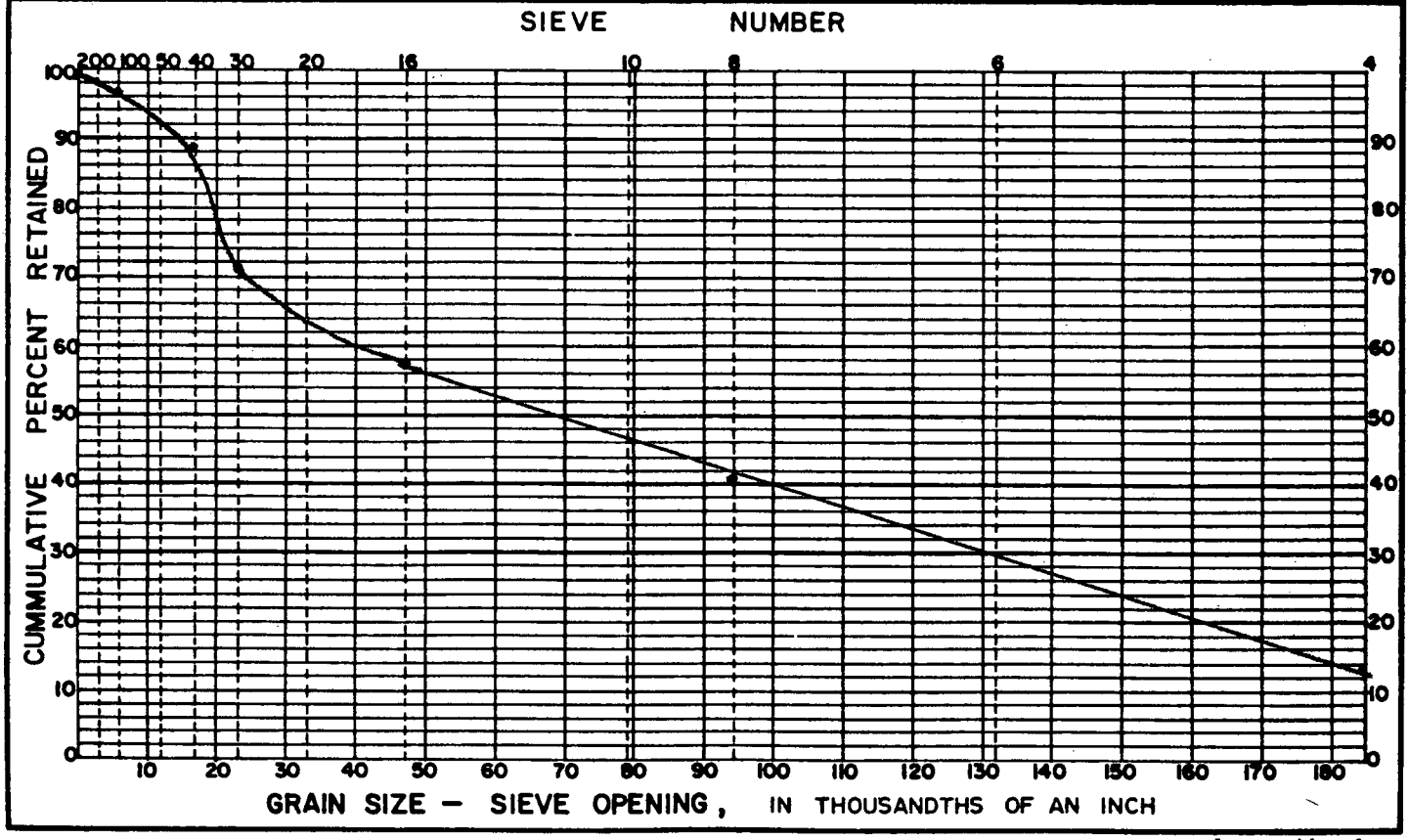
SAMPLE WEIGHT, IN grams	INTERVAL –	–
1. WT. ~~CONTAINER~~ + SAMPLE	614.3	
~~2. WT. CONTAINER~~		
3. WT. SAMPLE less than 1/2" size	598.2	
4. WT. SAMPLE 1/2" size and over	16.1	
5. WT. ENTIRE SAMPLE (i.e 3. + 4.)	614.3	
6. PERCENT SAMPLE 1/2" size and over	3 %	%

DEPTH INTERVAL (FEET)	SCREEN OPENING 90%	50%	40%	30%
76–80	15	70	100	130

NOTE: The following sieve analysis does not include the 1/2" size and over.

SIEVE NO.	INTERVAL — CUMM. WT. RET. IN grams	CUMM. % RET.	INTERVAL — CUMM. WT. RET. IN grams	CUMM. % RET.
4	78.2	13.0		
8	242.5	40.5		
16	346.6	57.9		
20	379.1	63.3		
30	426.0	71.2		
40	529.0	88.4		
100	576.6	96.4		
PAN	590.2	98.7		

REMARKS:



SIEVE ANALYSIS

PROJECT: Contract 76
LOCATION: Williams Lake, B.C.
WELL NO.: 289
ANALYSIS BY: W.S. Hodge DATE: Sept. 10/84

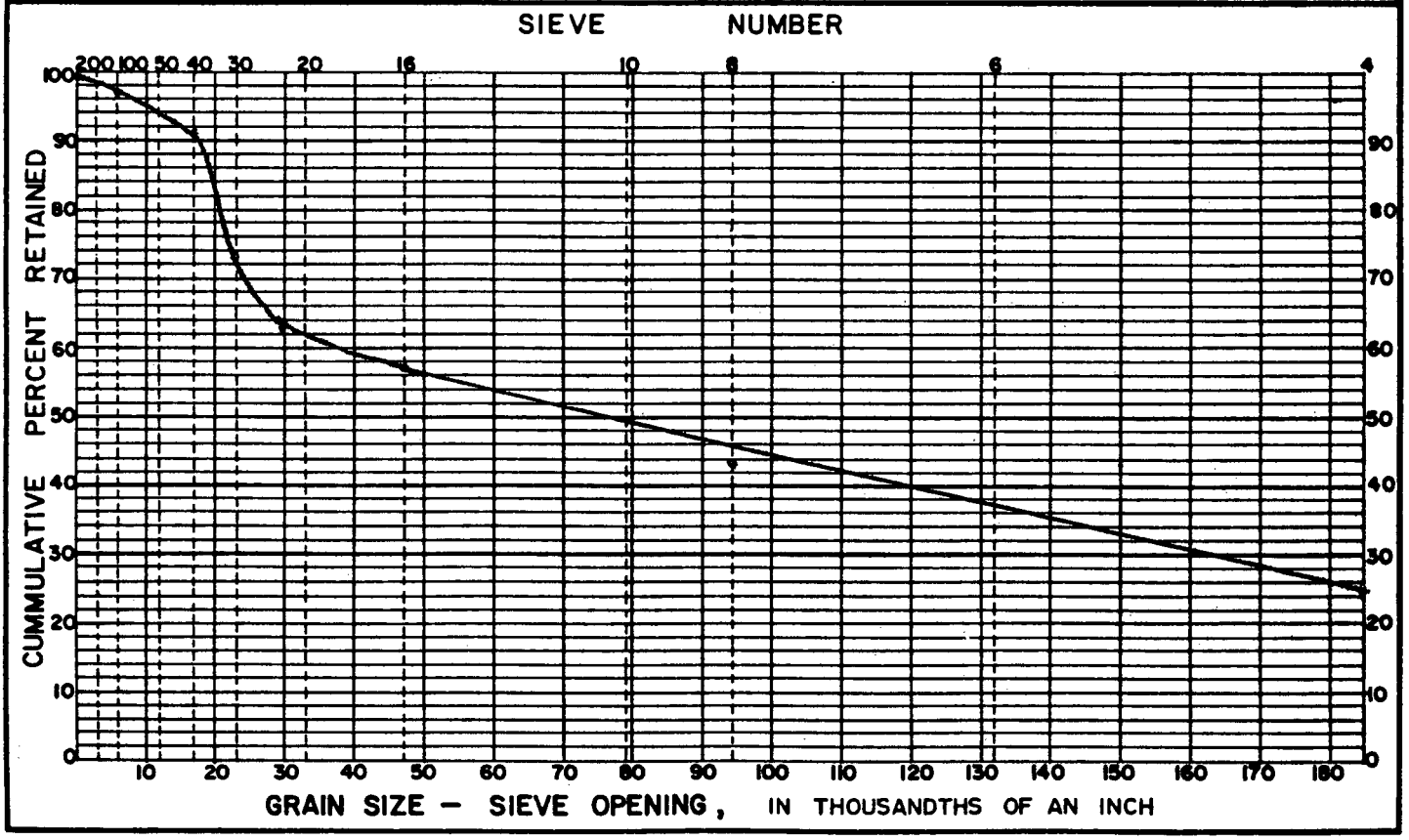
SAMPLE WEIGHT, IN grams	INTERVAL —	INTERVAL —
1. WT. ~~CONTAINER~~ + SAMPLE	710.0	
~~2. WT. CONTAINER~~		
3. WT. SAMPLE less than 1/2" size	602.3	
4. WT. SAMPLE 1/2" size and over	107.7	
5. WT. ENTIRE SAMPLE (i.e 3. + 4.)	710.0	
6. PERCENT SAMPLE 1/2" size and over	15 %	%

DEPTH INTERVAL (FEET)	SCREEN OPENING 90%	50%	40%	30%
80 — 82	118	80	120	165

NOTE: The following sieve analysis does not include the 1/2" size and over.

SIEVE NO.	INTERVAL — CUMM. WT. RET. IN grams	CUMM. % RET.	INTERVAL — CUMM. WT. RET. IN grams	CUMM. % RET.
4	152.9	25.3		
8	265.0	43.9		
16	343.9	57.1		
20	381.2	63.3		
30	437.8	72.7		
40	546.0	90.6		
100	586.0	97.2		
PAN	599.2	99.5		

REMARKS:



SIEVE ANALYSIS

PROJECT: Contract 76
LOCATION: Williams Lake, B.C.
WELL NO.: 289
ANALYSIS BY: W.S. Hodge DATE: Sept. 10/84

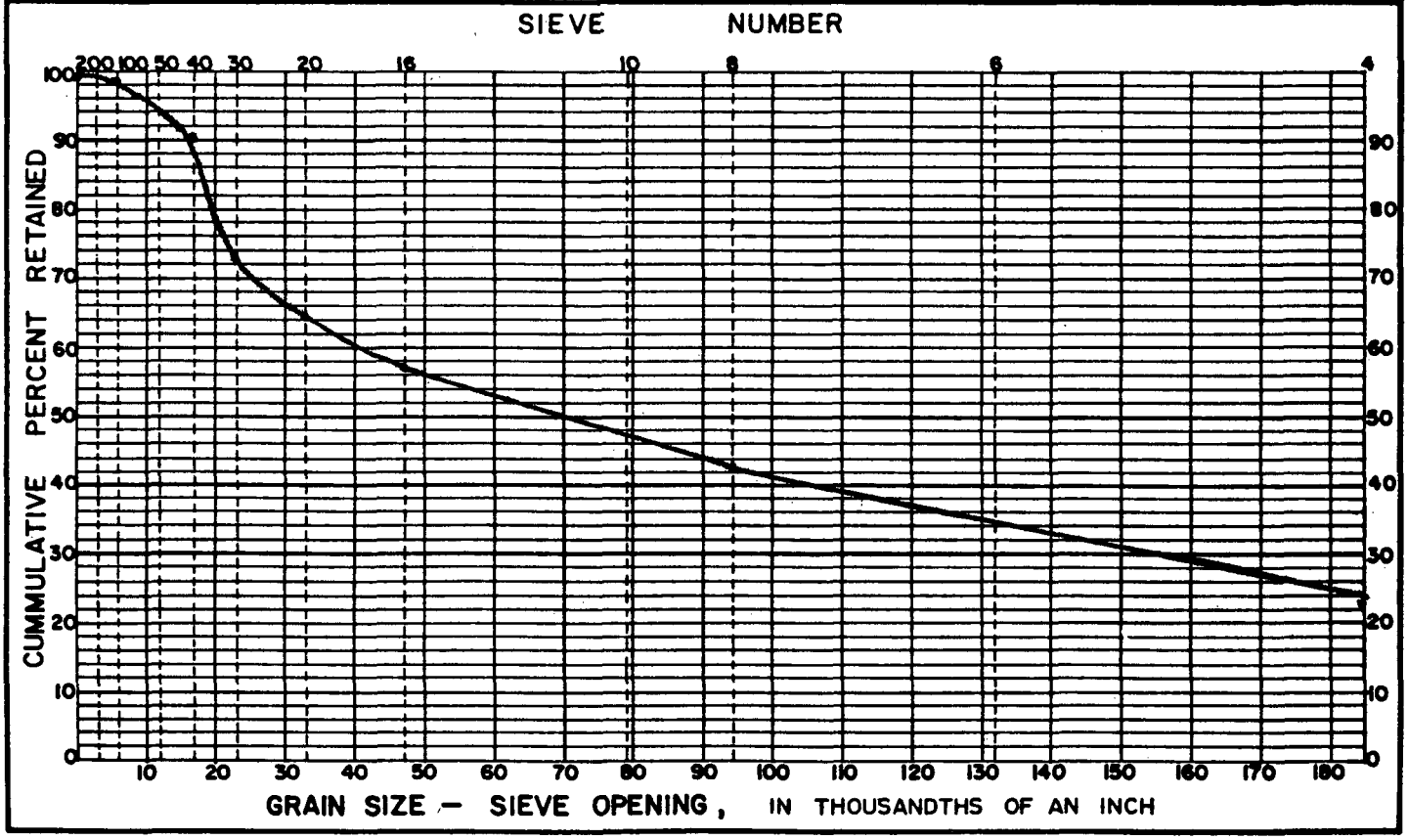
NOTE: The following sieve analysis does not include the 1/2" size and over.

SAMPLE WEIGHT, IN grams	INTERVAL —	INTERVAL —
1. WT. ~~CONTAINER~~ + SAMPLE	574.4	
~~2. WT. CONTAINER~~		
3. WT. SAMPLE less than 1/2" size	558.6	
4. WT. SAMPLE 1/2" size and over	15.8	
5. WT. ENTIRE SAMPLE (i.e 3. + 4.)	574.4	
6. PERCENT SAMPLE 1/2" size and over	3 %	%

DEPTH INTERVAL (FEET)	SCREEN OPENING 90%	50%	40%	30%
82—84	16	70	105	155

SIEVE NO.	INTERVAL — CUMM. WT. RET. IN grams	CUMM. % RET.	INTERVAL — CUMM. WT. RET. IN grams	CUMM. % RET.
4	130.0	23.3		
8	237.7	42.5		
16	318.2	56.9		
20	358.2	64.1		
30	407.2	72.9		
40	503.6	90.1		
100	549.9	98.4		
PAN	556.6	99.6		

REMARKS:



SIEVE ANALYSIS

PROJECT: Contract 76
LOCATION: Williams Lake, B.C.
WELL NO.: 289
ANALYSIS BY: W.S. Hodge DATE: Sept. 10/84

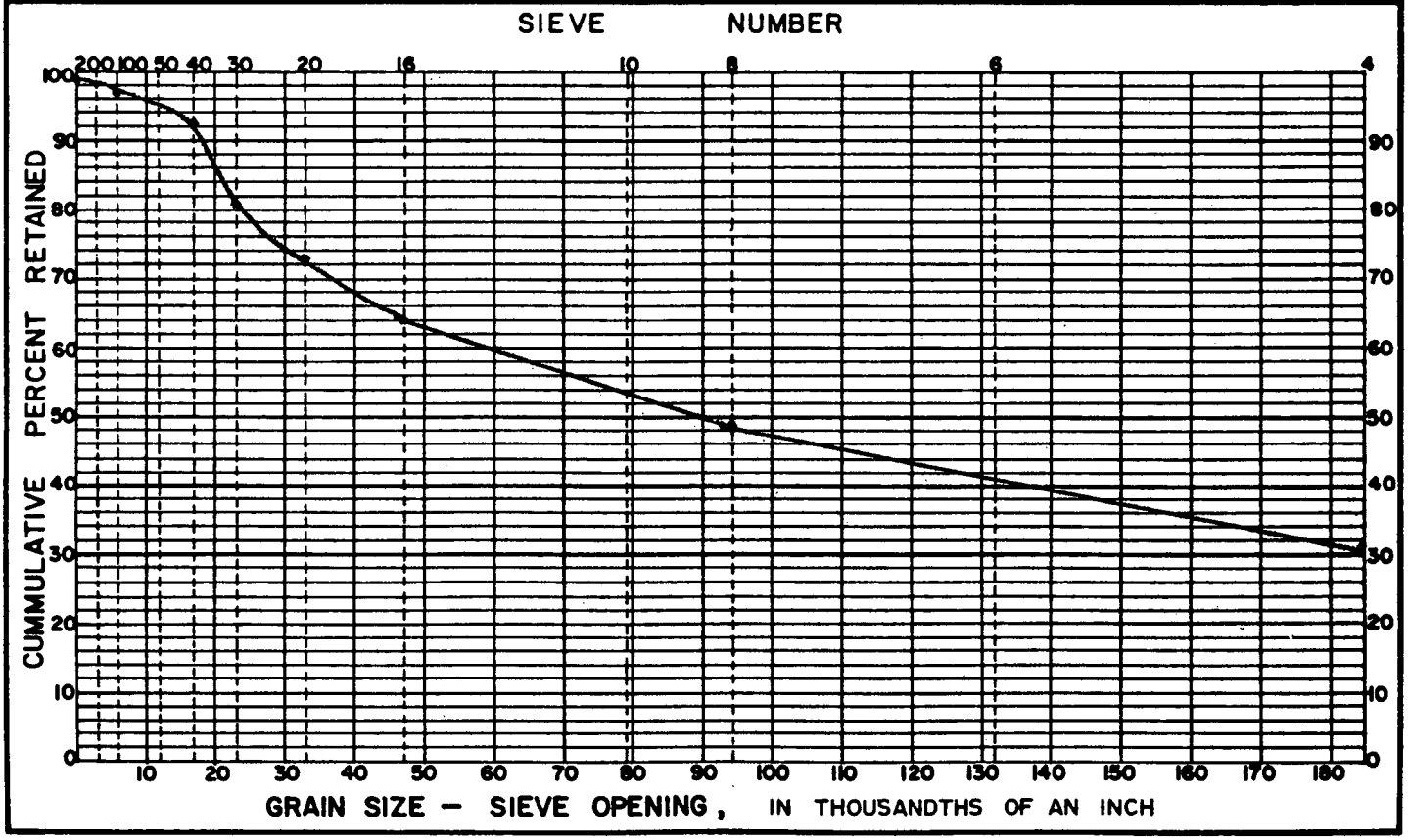
NOTE: The following sieve analysis does not include the 1/2" size and over.

SAMPLE WEIGHT, IN grams	INTERVAL —	INTERVAL —
1. WT. ~~CONTAINER~~ + SAMPLE	640.0	
~~2. WT. CONTAINER~~		
3. WT. SAMPLE less than 1/2" size	582.4	
4. WT. SAMPLE 1/2" size and over	57.6	
5. WT. ENTIRE SAMPLE (i.e 3. + 4.)	640.0	
6. PERCENT SAMPLE 1/2" size and over	9 %	%

DEPTH INTERVAL (FEET)	SCREEN OPENING 90%	50%	40%	30%
84 — 88	19	90	137	180+

SIEVE NO.	INTERVAL — CUMM. WT. RET. IN grams	CUMM. % RET.	INTERVAL — CUMM. WT. RET. IN grams	CUMM. % RET.
4	180.0	30.9		
8	283.2	48.6		
16	373.2	64.0		
20	424.9	72.9		
30	473.8	81.3		
40	537.9	92.3		
100	567.9	97.5		
PAN	578.9	99.4		

REMARKS:



SIEVE ANALYSIS

PROJECT: Contract 76
LOCATION: Williams Lake, B.C.
WELL NO.: 289
ANALYSIS BY: W.S. Hodge DATE: Sept. 10/84

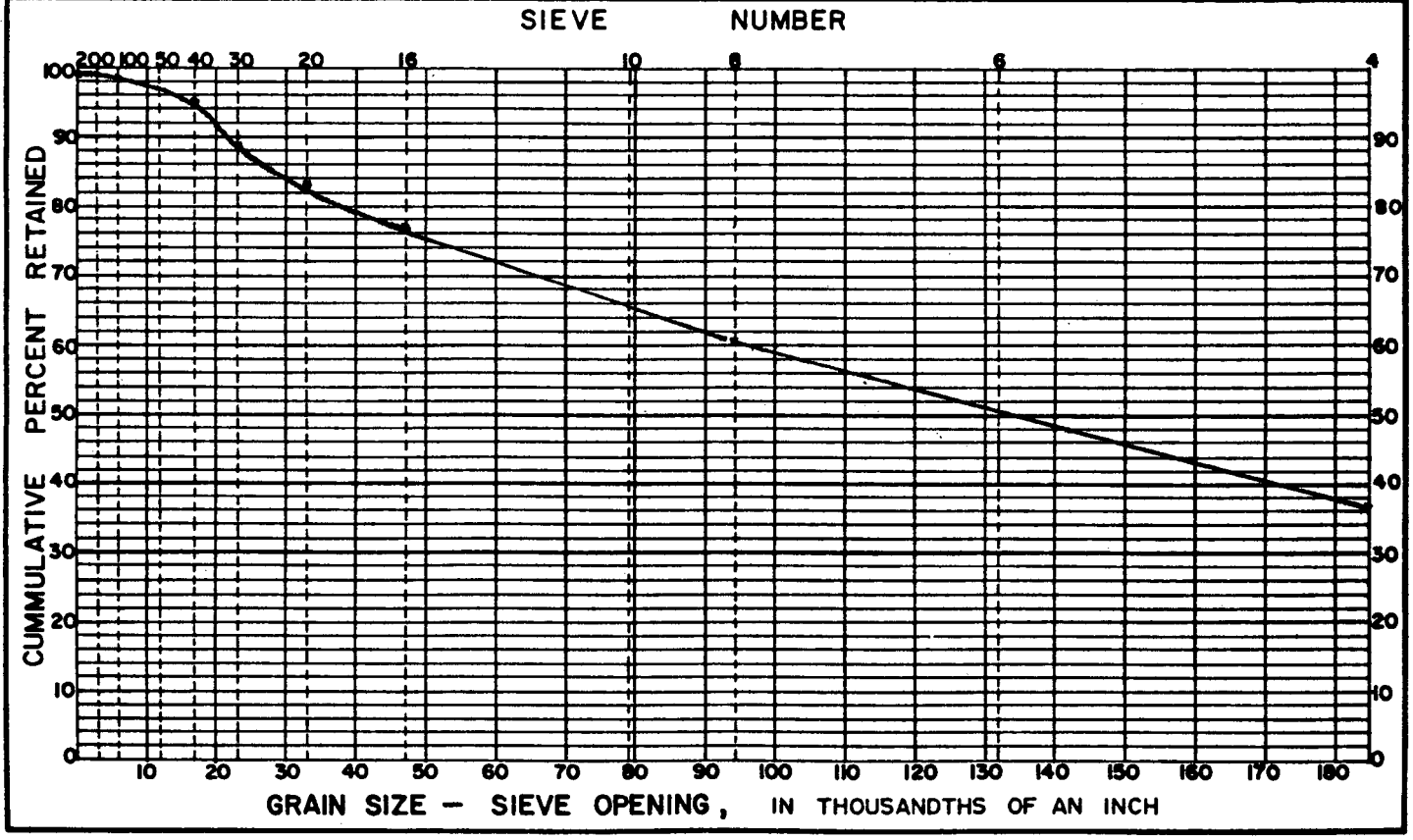
SAMPLE WEIGHT, IN grams	INTERVAL —	INTERVAL —
1. WT. ~~CONTAINER~~ + SAMPLE	810.0	
~~2. WT. CONTAINER~~		
3. WT. SAMPLE less than 1/2" size	703.6	
4. WT. SAMPLE 1/2" size and over	106.4	
5. WT. ENTIRE SAMPLE (i.e 3. + 4.)	810.0	
6. PERCENT SAMPLE 1/2" size and over	13 %	%

DEPTH INTERVAL (FEET)	SCREEN OPENING 90%	50%	40%	30%
88 — 90	19	135	172	180+

NOTE: The following sieve analysis does not include the 1/2" size and over.

SIEVE NO.	INTERVAL — CUMM. WT. RET. IN grams	CUMM. % RET.	INTERVAL — CUMM. WT. RET. IN grams	CUMM. % RET.
4	259.2	36.8		
8	422.9	60.1		
16	539.9	76.7		
20	585.4	83.2		
30	625.2	88.8		
40	674.0	95.8		
100	691.9	98.3		
PAN	697.9	99.2		

REMARKS:



SIEVE ANALYSIS

PROJECT: Contract 76
LOCATION: Williams Lake, B.C.
WELL NO.: 289
ANALYSIS BY: W.S. Hodge DATE: Sept. 10/84

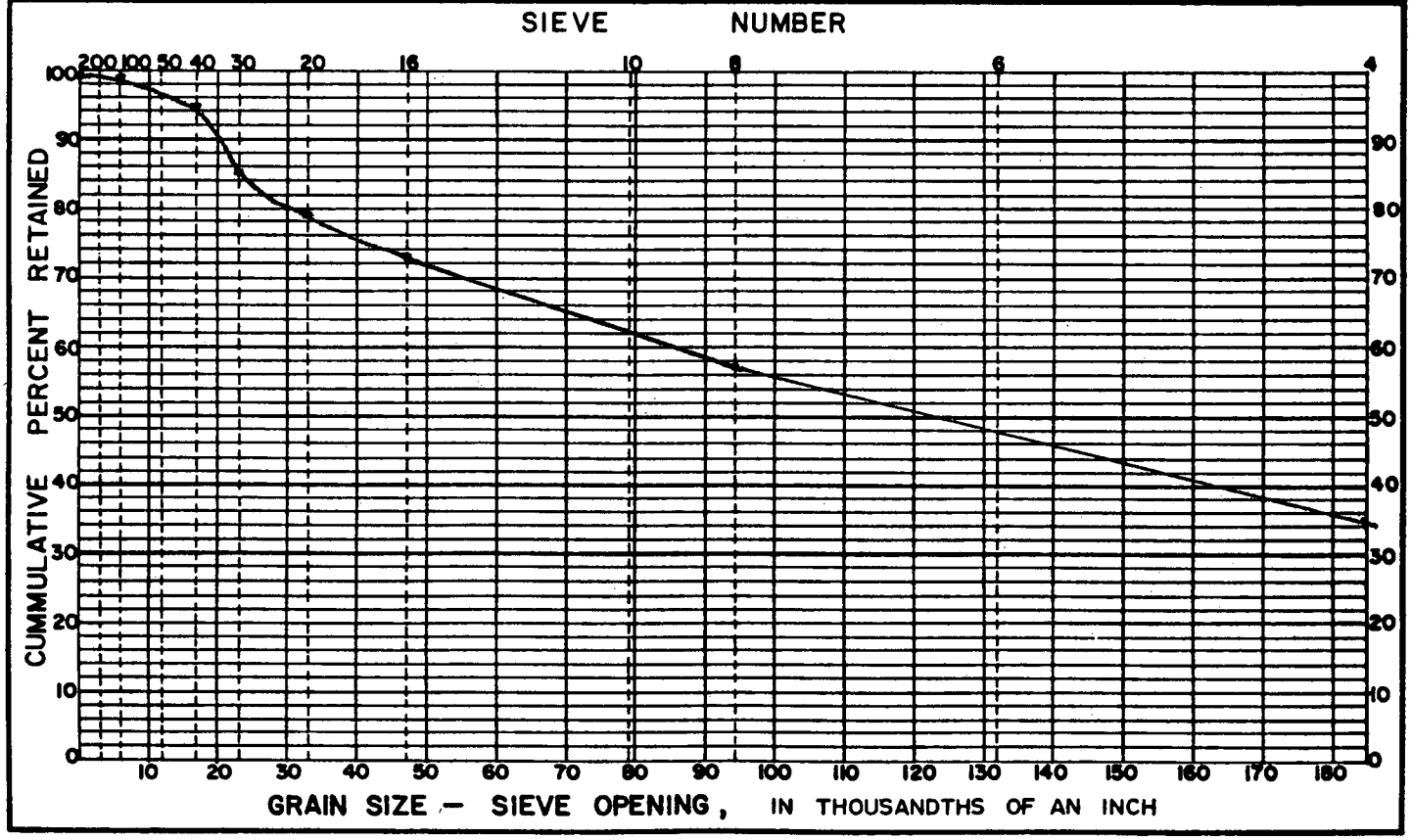
SAMPLE WEIGHT, IN grams	INTERVAL —	INTERVAL —
1. WT. ~~CONTAINER +~~ SAMPLE	816.8	
~~2. WT. CONTAINER~~		
3. WT. SAMPLE less than 1/2" size	669.9	
4. WT. SAMPLE 1/2" size and over	146.9	
5. WT. ENTIRE SAMPLE (i.e 3. + 4.)	816.8	
6. PERCENT SAMPLE 1/2" size and over	18 %	%

DEPTH INTERVAL (FEET)	SCREEN OPENING 90%	50%	40%	30%
90 — 92	20	124	165	180+

NOTE: The following sieve analysis does not include the 1/2" size and over.

SIEVE NO.	INTERVAL — CUMM. WT. RET. IN grams	CUMM. % RET.	INTERVAL — CUMM. WT. RET. IN grams	CUMM. % RET.
4	233.3	34.8		
8	383.3	57.2		
16	491.1	73.3		
20	533.0	79.6		
30	571.2	85.3		
40	631.2	94.2		
100	667.0	99.5		
PAN	668.2	99.7		

REMARKS:



SIEVE ANALYSIS

PROJECT: Contract 76
LOCATION: Williams Lake, B.C.
WELL NO.: 289
ANALYSIS BY: W.S. Hodge DATE: Sept. 10/84

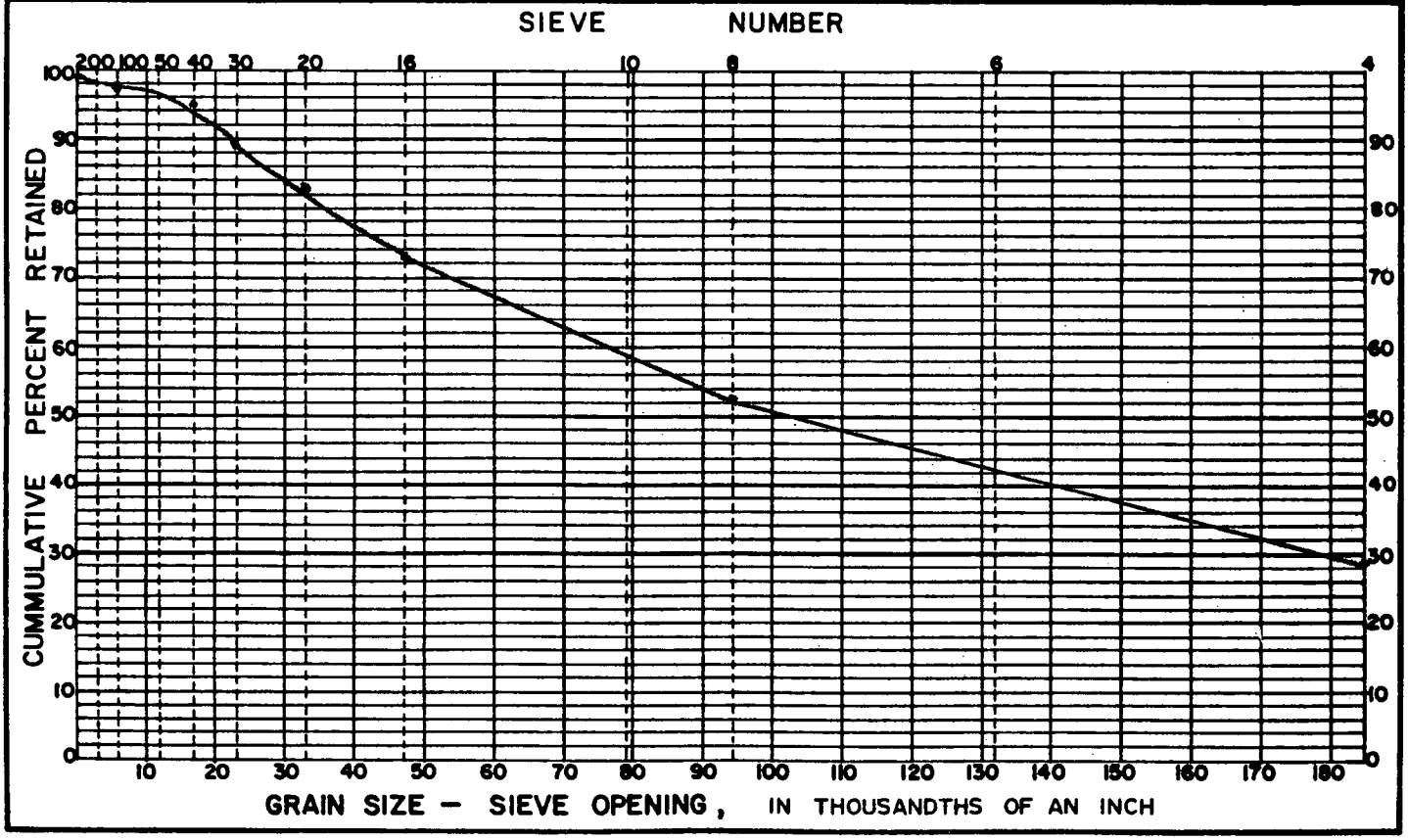
NOTE: The following sieve analysis does not include the 1/2" size and over.

SAMPLE WEIGHT, IN grams	INTERVAL —	INTERVAL —
1. WT. ~~CONTAINER~~ + SAMPLE	870.0	
~~2. WT. CONTAINER~~		
3. WT. SAMPLE less than 1/2" size	702.6	
4. WT. SAMPLE 1/2" size and over	167.4	
5. WT. ENTIRE SAMPLE (i.e 3. + 4.)	702.6	
6. PERCENT SAMPLE 1/2" size and over	19 %	%

DEPTH INTERVAL (FEET)	SCREEN OPENING 90 %	50 %	40 %	30 %
92 — 94	23	104	140	180

SIEVE NO.	INTERVAL — CUMM. WT. RET. IN grams	CUMM. % RET.	INTERVAL — CUMM. WT. RET. IN grams	CUMM. % RET.
4	202.5	28.8		
8	366.6	52.1		
16	519.9	73.9		
20	583.9	83.1		
30	629.5	89.5		
40	667.9	95.1		
100	684.9	97.5		
PAN	693.9	98.8		

REMARKS:



SIEVE ANALYSIS

PROJECT: Contract 76
LOCATION: Williams Lake, B.C.
WELL NO.: 289
ANALYSIS BY: W.S. Hodge DATE: Sept. 10/84

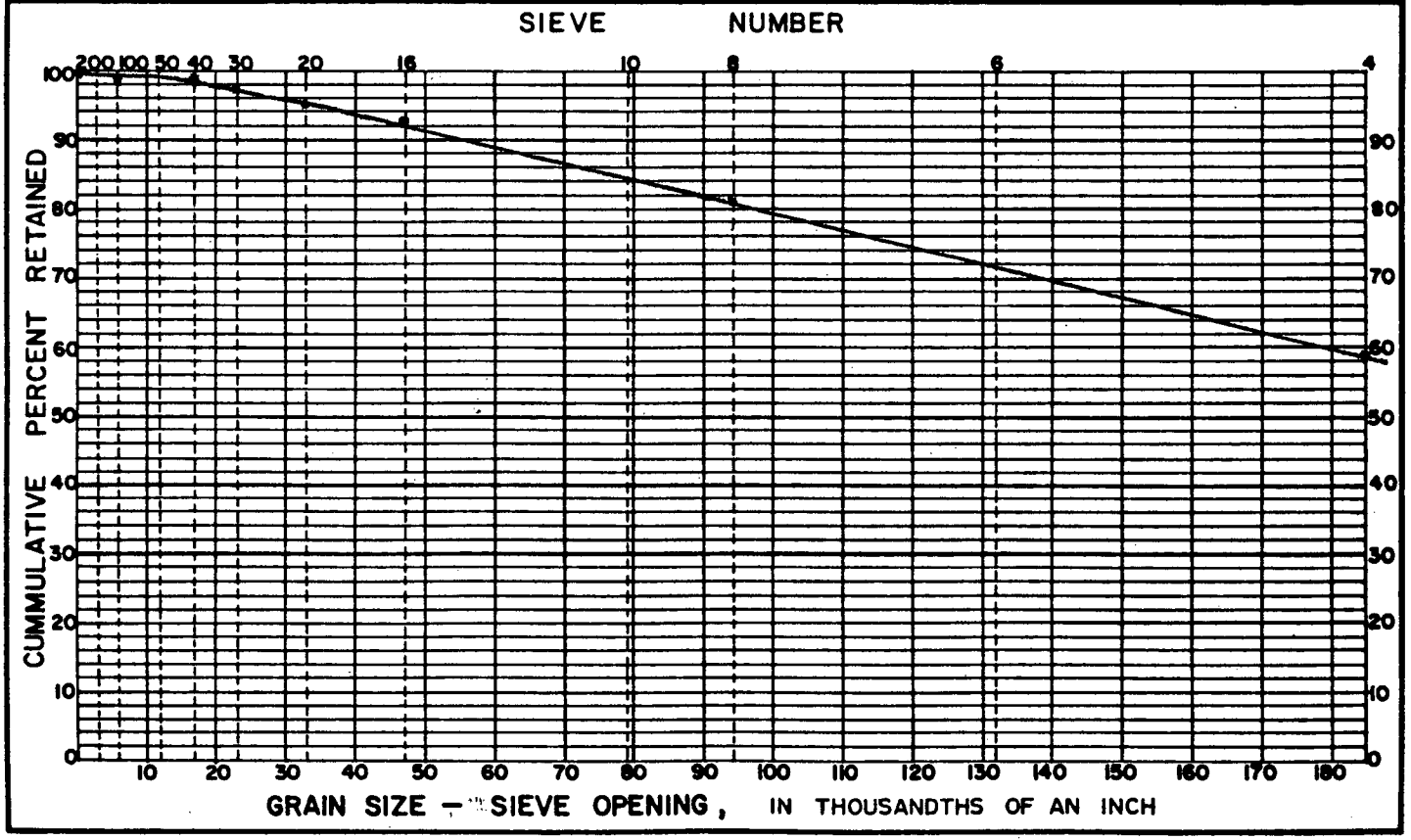
NOTE: The following sieve analysis does not include the 1/2" size and over.

SAMPLE WEIGHT, IN grams	INTERVAL –	INTERVAL –
1. WT. ~~CONTAINER +~~ SAMPLE	837.6	
~~2. WT. CONTAINER~~		
3. WT. SAMPLE less than 1/2" size	616.4	
4. WT. SAMPLE 1/2" size and over	221.2	
5. WT. ENTIRE SAMPLE (i.e 3. + 4.)	837.6	
6. PERCENT SAMPLE 1/2" size and over	26 %	%

SIEVE NO.	INTERVAL – CUMM. WT. RET. IN grams	INTERVAL – CUMM. % RET.	INTERVAL – CUMM. WT. RET. IN grams	INTERVAL – CUMM. % RET.
4	363.8	59.0		
8	501.3	81.3		
16	570.0	92.5		
20	588.3	95.4		
30	598.3	97.1		
40	609.9	98.9		
100	613.8	99.6		
PAN	616.2	99.9		

DEPTH INTERVAL (FEET)	SCREEN OPENING 90 %	50 %	40 %	30 %
94 – 95	55	180+	180+	180+

REMARKS:



SIEVE ANALYSIS

PROJECT: Contract 76
LOCATION: Williams Lake, B.C.
WELL NO.: 289
ANALYSIS BY: W.S. Hodge DATE: Sept. 10/84

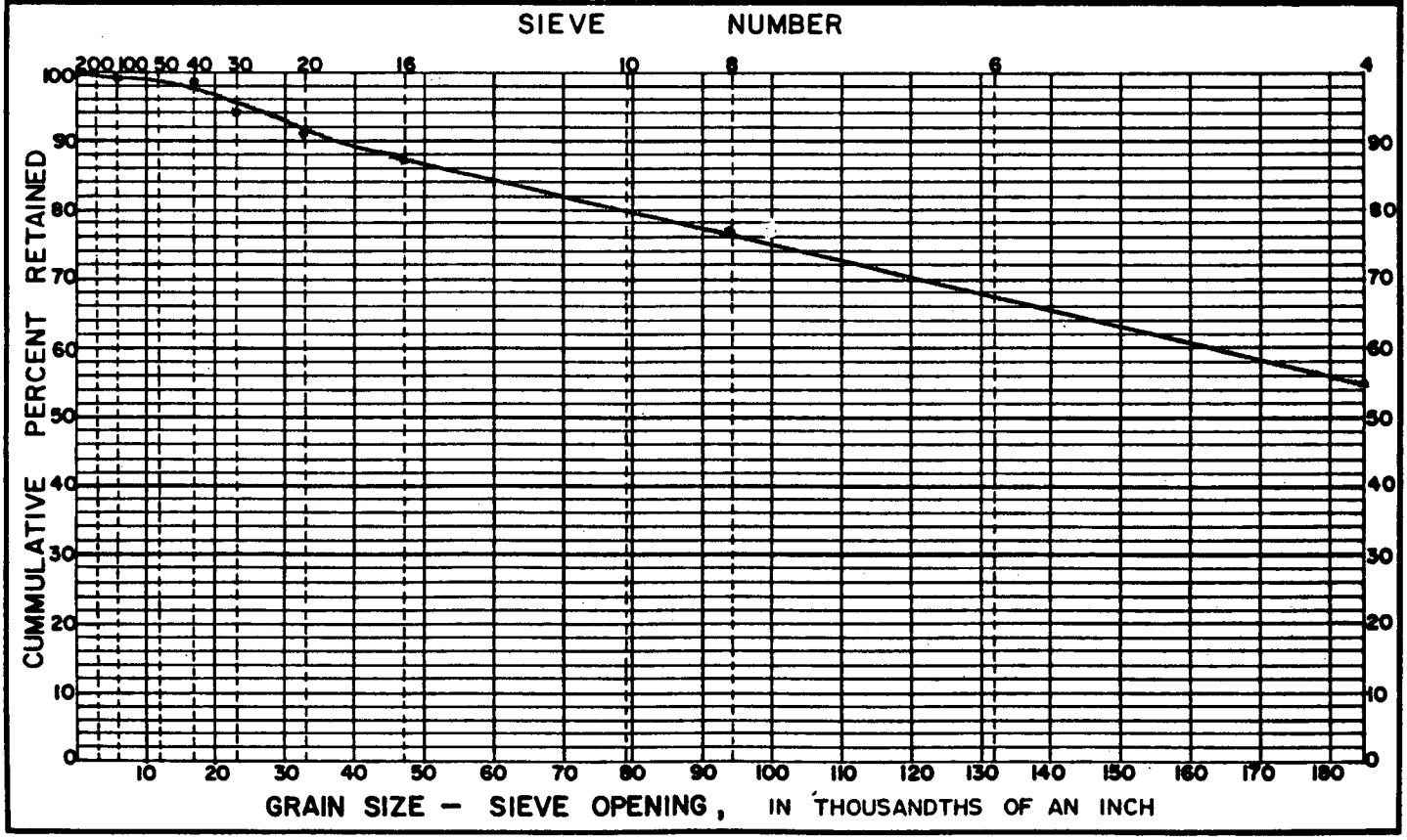
NOTE: The following sieve analysis does not include the 1/2" size and over.

SAMPLE WEIGHT, IN grams	INTERVAL —	INTERVAL —
1. WT. ~~CONTAINER +~~ SAMPLE	860.9	
~~2. WT. CONTAINER~~		
3. WT. SAMPLE less than 1/2" size	722.9	
4. WT. SAMPLE 1/2" size and over	138.0	
5. WT. ENTIRE SAMPLE (i.e 3. + 4.)	860.9	
6. PERCENT SAMPLE 1/2" size and over	16 %	%

DEPTH INTERVAL (FEET)	SCREEN OPENING 90 %	50 %	40 %	30 %
95 — 97	37	180+	180+	180+

SIEVE NO.	INTERVAL — CUMM. WT. RET. IN grams	CUMM. % RET.	INTERVAL — CUMM. WT. RET. IN grams	CUMM. % RET.
4	395.5	54.7		
8	551.1	76.4		
16	631.1	87.3		
20	657.8	90.9		
30	679.9	94.0		
40	709.9	98.2		
100	719.9	99.6		
PAN	721.8	99.8		

REMARKS:



SIEVE ANALYSIS

PROJECT: Contract 76
LOCATION: Williams Lake, B.C.
WELL NO.: 289
ANALYSIS BY: W.S. Hodge DATE: Sept. 10/84

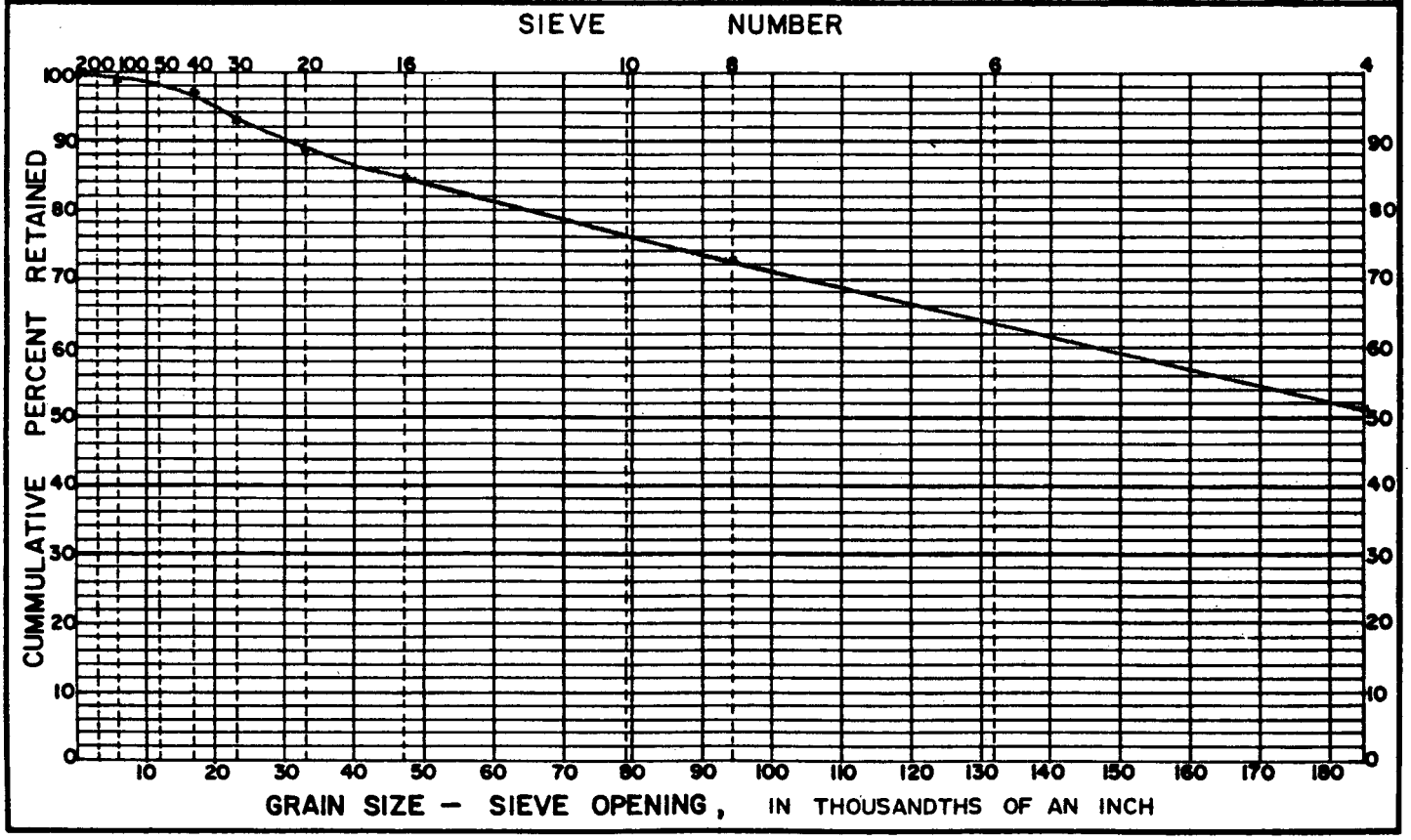
NOTE: The following sieve analysis does not include the 1/2" size and over.

SAMPLE WEIGHT, IN grams	INTERVAL –	INTERVAL –
1. WT. ~~CONTAINER +~~ SAMPLE	973.3	
~~2. WT. CONTAINER~~		
3. WT. SAMPLE less than 1/2" size	691.3	
4. WT. SAMPLE 1/2" size and over	282.0	
5. WT. ENTIRE SAMPLE (i.e 3. + 4.)	973.3	
6. PERCENT SAMPLE 1/2" size and over	29 %	%

DEPTH INTERVAL (FEET)	SCREEN OPENING 90%	50%	40%	30%
97 – 98	30	180	180+	180+

SIEVE NO.	INTERVAL – CUMM. WT. RET. IN grams	CUMM. % RET.	INTERVAL – CUMM. WT. RET. IN grams	CUMM. % RET.
4	358.0	51.8		
8	500.4	72.4		
16	583.2	84.4		
20	613.4	88.7		
30	640.0	92.6		
40	674.9	97.6		
100	682.7	98.7		
PAN	689.9	99.8		

REMARKS:



SIEVE ANALYSIS

PROJECT: Contract 76
LOCATION: Williams Lake, B.C.
WELL NO.: 289
ANALYSIS BY: W.S. Hodge DATE: Sept. 10/84

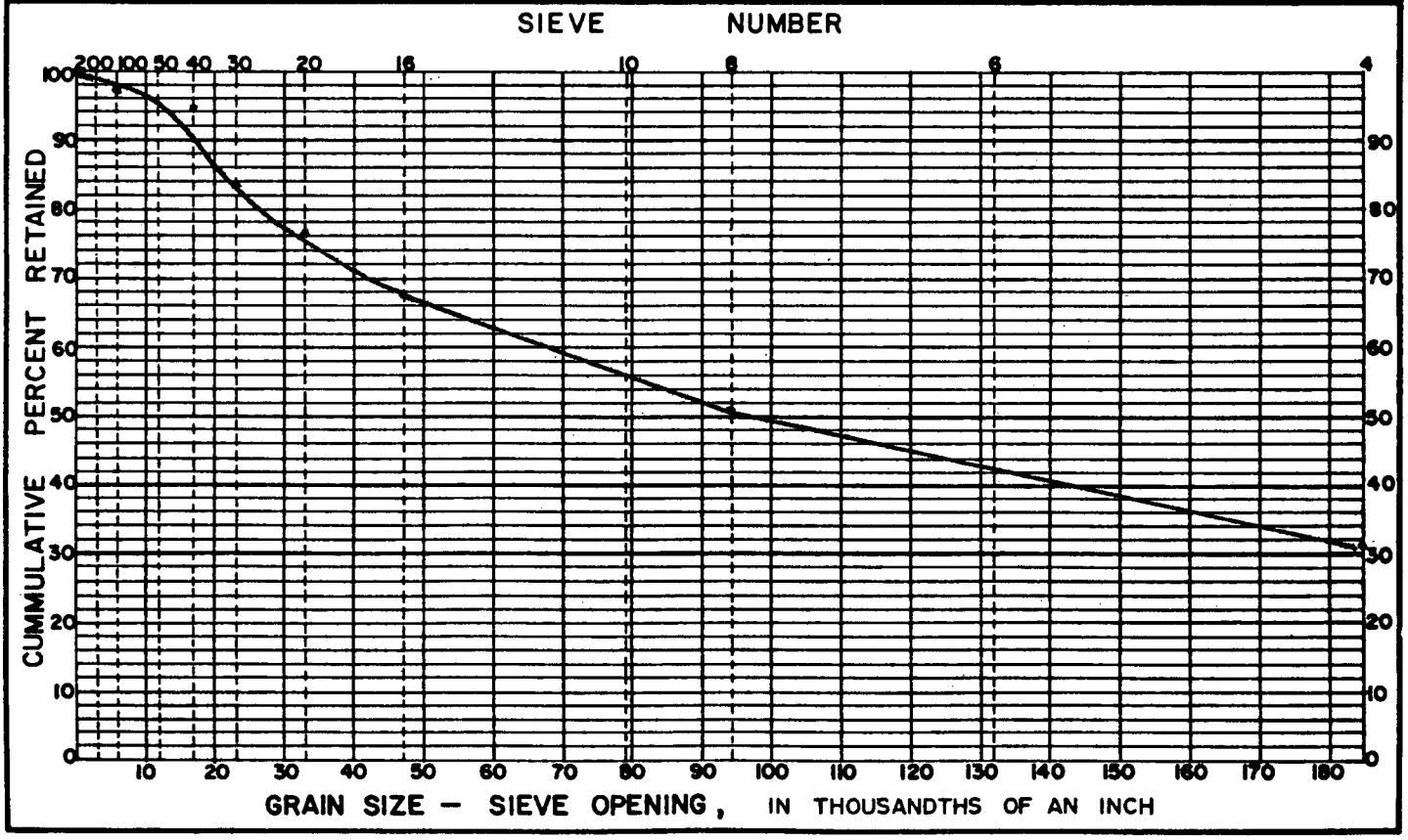
NOTE: The following sieve analysis does not include the 1/2" size and over.

SAMPLE WEIGHT, IN grams	INTERVAL —	INTERVAL —
1. WT. ~~CONTAINER +~~ SAMPLE	783.1	
~~2. WT. CONTAINER~~		
3. WT. SAMPLE less than 1/2" size	722.5	
4. WT. SAMPLE 1/2" size and over	60.6	
5. WT. ENTIRE SAMPLE (i.e 3. + 4.)		
6. PERCENT SAMPLE 1/2" size and over	8 %	%

SIEVE NO.	INTERVAL — CUMM. WT. RET. IN grams	INTERVAL — CUMM. % RET.	INTERVAL — CUMM. WT. RET. IN grams	INTERVAL — CUMM. % RET.
4	226.6	31.4		
8	362.4	50.1		
16	491.0	67.9		
20	550.0	76.1		
30	604.3	83.6		
40	680.0	94.1		
100	705.9	97.7		
PAN	719.8	99.6		

DEPTH INTERVAL (FEET)	SCREEN OPENING 90%	50%	40%	30%
98 — 100	17	95	145	180

REMARKS:



APPENDIX B

Water Level Recorder Installation
Specifications, Water Quality Analysis,
Water Level Hydrograph,
Photographs of Well Construction, Testing, and Recorder Installation

Province of British Columbia
Ministry of Environment
WATER MANAGEMENT BRANCH

MEMORANDUM

To: File

Date: April 12, 1984

File: 0183613-B-289

Re: Establishment of Observation Well #289
- Pine Valley, Williams Lake, B.C.

Introduction:

On March 22, 1984, an automatic water level recorder was installed on the recently drilled observation well in Pine Valley northeast of Williams Lake. The well was drilled and tested under Government Contract #76 - "Drilling, Construction and Testing of One Groundwater Observation Well in the Pine Valley Area, Northeast of Williams Lake, B.C. - March 1984"

The purpose of establishing this observation well was to monitor long-term water level fluctuations in the aquifer. Concern has been expressed over aquifer depletion caused from overpumping the aquifer by the numerous domestic wells located in this area.

Well Location:

The well is located approximately 6 miles (9⅝ kilometres) northeast of Williams Lake at the east end of the Pine Valley Subdivision along the Pine Valley Road. Attached to this memorandum is a copy of "Permission to Construct Works within Crown Lands" which has been approved by the Ministry of Transportation and Highways.

Well Drilling and Testing Details:

Date Drilled	- March 19-20, 1984
Drilling Contractor	- Manville Drilling (B.C.) Co. Ltd.
Well Depth	- 95 feet
Well Diameter	- 6-inch
Aquifer Description	- gravel
Static Water Level	- 23 feet
Screen Type	- Johnson stainless steel
Screen Location	- 91-95 feet
Screen Slot Size 1	- 15 slot
Development Method	- air surging (1 hours)
Date Tested	- March 21, 1984
Pumping Test Contractor	- Hillside Pumps
Pump Type and Size	- Jacuzzi submersible - 3HP
Pumping Rate	- 25 USgpm
Duration of Test	- 8 hours
Recovery	- 1.5 hours

..... /2

apk. mw

Pumping Test:

The pumping test was conducted on March 21, 1984 by Hillside Pumps of Williams Lake, B.C. The well was pumped for 8 hours at a constant rate of 25 USgpm. The pump was set at a depth of 70 feet below ground level. The initial static water level was 23 feet below the top of casing. Total drawdown during pumping was 0.77 feet utilizing approximately 2 percent of the total available drawdown of 47 feet. Recovery was 0.21 feet (0.065 metres) from complete after 90 minutes. A final recovery reading was taken after approximately 16 hours showing recovery to be complete. It is obvious from the pump test data received that the well is capable of sustaining a much greater yield. A Transmissivity of 3.1×10^4 USgpd/ft was calculated from the drawdown data. A Transmissivity of 4.6×10^4 USgpd/ft was calculated from the recovery data.

Equipment on Site:

1 - steel recorder housing (15" x 22" x 24")
1 - 6-inch diameter steel casing extension (4-foot length)
1 - 4-inch diameter weight drive pipe
1 - wood recorder stand with pulley
1 - 8 kg. lead clock drive weight
1 - 127 mm diameter float
1 - 12 metre graduated tape
1 - metric Stevens water level recorder (RG 55) with Chelsea Clock (CG 56) with 2:1 gage scale
1 - 2 clips
1 - 6 ounce counterweight
1 - Viro lock

The recorder housing and standpipes were painted dark green and a Ministry of Environment identification label and number (289) was placed on the door of the housing.

Ground Level Datum Measurements:

Static water level to pointer - 8.314 metres
Ground level (chisel mark slightly above the concrete pad) to pointer - 1.575 metres
Graduated tape reading - 2.890 metres

The correction factor to be applied to the tape reading is therefore + 3.849 metres.

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Obse r Particulars:

Mr. Bill Klopp (Head of Inventory and Engineering Section)
Ministry of Environment
540 Borland Street
Williams Lake, B.C.
V2G 1R8

Telephone: 2-6-298

Mr. Klopp has been given 2 boxes of recorder charts and a Viro Key. He has been instructed fully in recorder operation and maintenance.

W.S. Hodge

W.S. Hodge
Technician
Groundwater Section
Water Management Branch
387-1115

* Refer to NTS file 93 B/1 #35 for complete information on the Drilling, Construction and Testing of One Groundwater Observation Well in the Pine Valley Area, Northeast of Williams Lake, B.C.

MAY 30, 1984 ENVIRONMENTAL LABORATORY PAGE 1
MINISTRY OF THE ENVIRONMENT
JUN - 4 1984

WATER QUALITY REPORT FOR SAMPLE 317741W

TO: INVENTORY & ENGIN. BR.
765 BROUGHTON 4TH FLOOR
VICTORIA, B.C.
ATTENTION OF: D KALYN

FOR SITE: 1401954 WILLIAMS LK OBS WELL 289

SAMPLING DATE(S): MAR 21/84 1110 HRS
SAMPLE TYPE: FRESH WATER
SAMPLING DEPTH: 0
SAMPLED BY: GROUNDWATER SECTION
CHARGE TO: WATER PGM (VICTORIA)
DATE PROCESSED TO COMPUTER: MAR 23/84

140103	PH	8.3 REL UNIT	0071701	RES:FILT.105C	590. MG/L
110101	SPECIFIC CONDUC	1000. UMHO/CM	1010105	ALKALINITY:PHNL	L 0.5 MG/L
320106	ALKALINITY:TOT	508. MG/L	1041702	CHLORIDE	1.5 MG/L
061704	FLUORIDE	0.3 MG/L	1091703	NITROGN:NO2 NO3	L 0.02* MG/L
130105	NITROGN:KJELDAH	0.08 MG/L	1191703	PHOSPHORUS :TOT DISSOLVED	0.037 MG/L
201702	SILICA:REACTIVE	20.7 MG/L	1211703	SULPHATE	89.* MG/L
641703	POTASSIUM DISSOLVED	5.3* MG/L	2651703	SODIUM DISSOLVED	20.6* MG/L

FOLLOWING ARE PACKAGE TESTS:

510214	ARSENIC TOTAL	L 0.25 MG/L	2511413	ARSENIC DISSOLVED	L 0.25 MG/L
521413	BORON DISSOLVED	0.03 MG/L	2530214	CADMIUM TOTAL	L 0.01 MG/L
531413	CADMIUM DISSOLVED	L 0.01 MG/L	2550214	CHROMIUM TOTAL	0.01 MG/L
551413	CHROMIUM DISSOLVED	L 0.01 MG/L	2560214	COPPER TOTAL	L 0.01 MG/L
561413	COPPER DISSOLVED	L 0.01 MG/L	2570214	IRON TOTAL	0.25 MG/L

SAMPLE NO. 317741W CONTINUED ON NEXT PAGE.

WATER QUALITY REPORT FOR SAMPLE 317741W

2571413	IRON DISSOLVED	0.07 MG/L	2580214	LEAD TOTAL	L 0.1 MG/L
2581413	LEAD DISSOLVED	L 0.1 MG/L	2600214	MANGANESE TOTAL	0.25 MG/L
2601413	MANGANESE DISSOLVED	0.24 MG/L	2620214	MOLYBDENUM TOTAL	0.05 MG/L
2621413	MOLYBDENUM DISSOLVED	0.05 MG/L	2630214	NICKEL TOTAL	L 0.05 MG/L
2631413	NICKEL DISSOLVED	L 0.05 MG/L	2660214	ZINC TOTAL	L 0.01 MG/L
2661413	ZINC DISSOLVED	L 0.01* MG/L	2670214	ALUMINUM TOTAL	0.08 MG/L
2671413	ALUMINUM DISSOLVED	0.07 MG/L	2680214	COBALT TOTAL	L 0.1 MG/L
2681413	COBALT DISSOLVED	L 0.1* MG/L	2701413	BARIUM DISSOLVED	0.05 MG/L
2720214	VANADIUM TOTAL	L 0.01 MG/L	2721413	VANADIUM DISSOLVED	L 0.01 MG/L

THE APPROXIMATE COST OF THE ABOVE TESTS IS $ 187.20

THERE IS NO CHARGE FOR THE FOLLOWING TESTS

1070002	HARDNES,T:CACO3	N MG/L	2540214	CALCIUM TOTAL	H MG/L
2541413	CALCIUM DISSOLVED	H MG/L	2590214	MAGNESIUM TOTAL	H MG/L
2591413	MAGNESIUM DISSOLVED	H MG/L			

REMARKS:

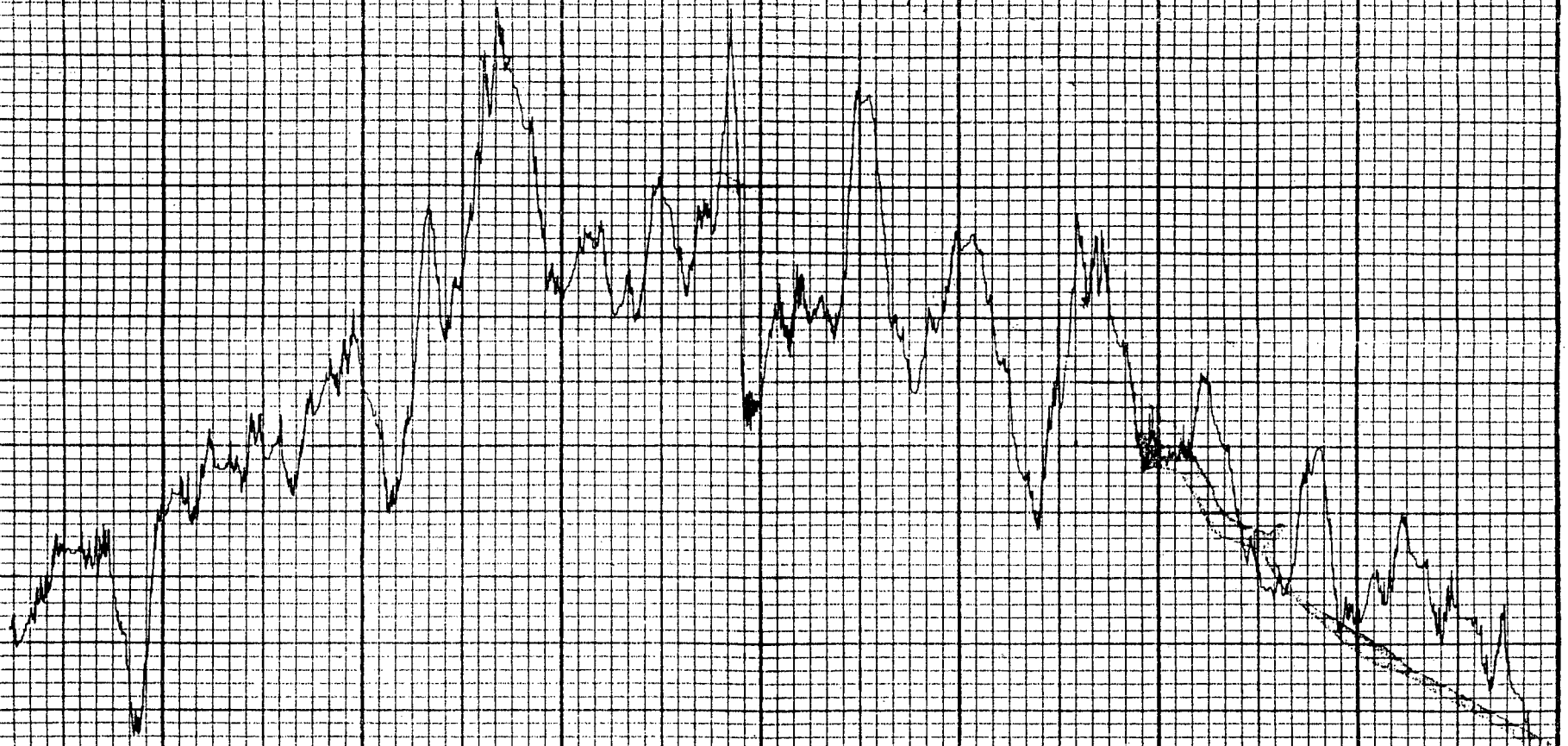
FOR ENVIRONMENTAL LABORATORY

MINISTRY OF ENVIRONMENT
WATER RESOURCES SERVICE
MOTHORLAND STREET
WILLIAMS LAKE, B.C. V2G 1R8

Pine Valley #289

84-02-30 12:50 2.980

10



Province of British Columbia
Ministry of Environment
WATER MANAGEMENT BRANCH

TO ACCOMPANY REPORT ON
Drilling Construction and Testing of One Groundwater Observation Well in the Pine Valley Area, Northeast of Williams Lake, B.C.

SCALE: VERT. N/A
HOR. N/A

DATE May 1984

M. Wei ENGINEER

FILE No. 93 B/1 DWG. No. Appendix B

Appenxix B

Lenpold & Stevens Instruments, Inc., Beaverton, Ore.

Litho in U.S.A.

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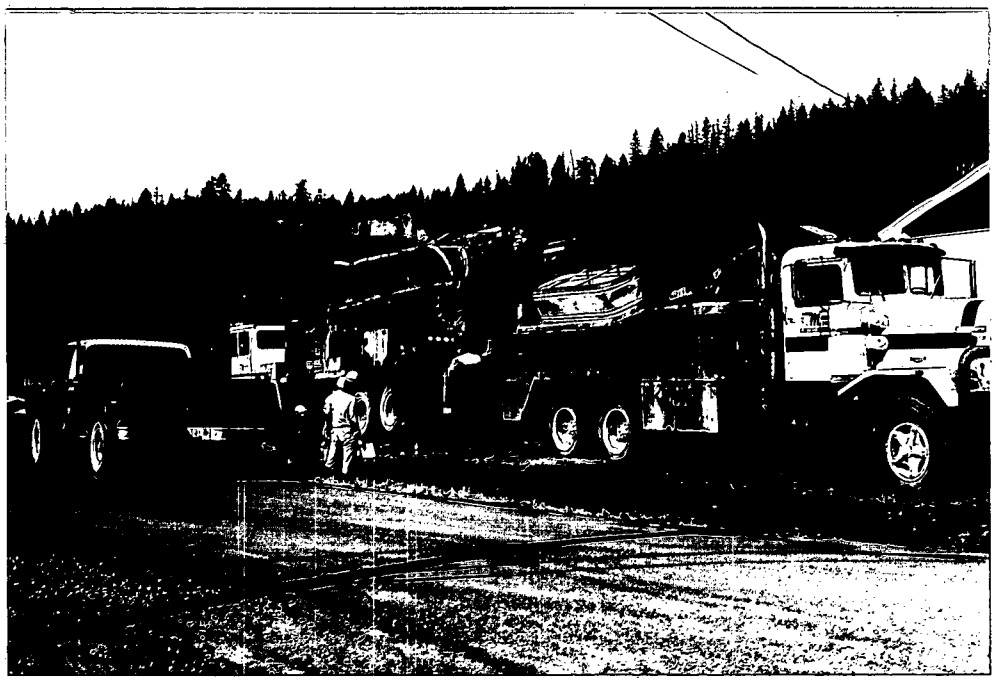
Stevens Water Level Recorder – Type F

Chart F-4

Williams Lake (Pine Valley) Observation Well #289



Setting Up

Well construction

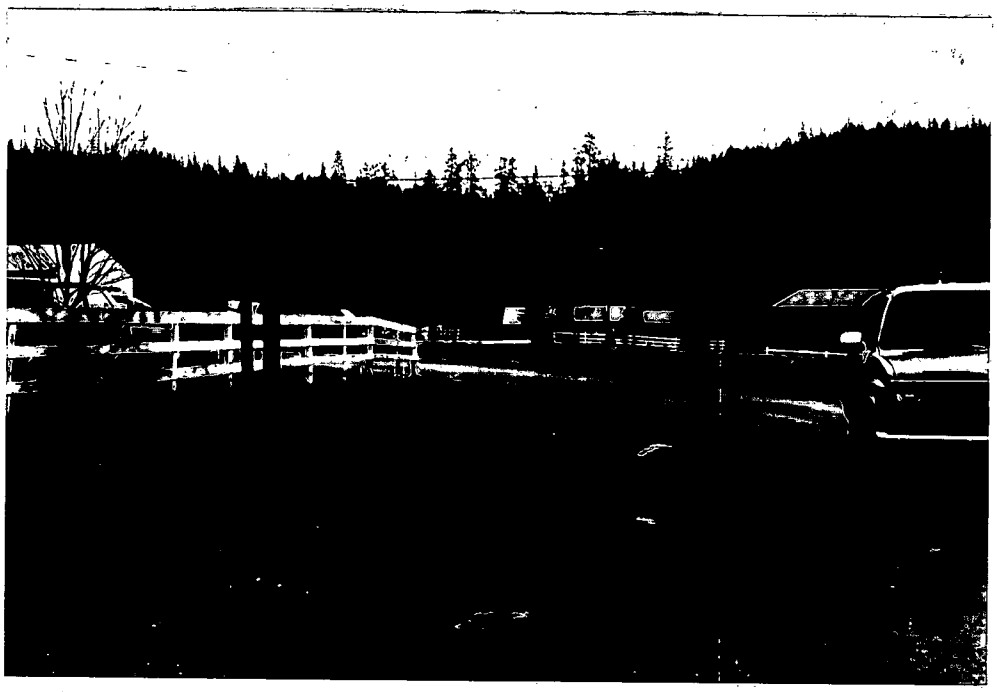
Appendix B.

Preparing the well screen

Developing the well

Installing the test pump

Measuring the flow



Installation of water level recorder